FORESTRY ABSTRACTS

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THE ELECTRIC FENCE IN FORESTRY

ALTHOUGH electrical shocking devices of various kinds have been used for nearly forty years and the electric fence has been manufactured commercially for over a quarter of a century, it is only of recent years that the farmer, followed much more cautiously by the forester, has really taken to the idea. Published literature on the subject is accordingly meagre, particularly so on the forest side, and the forest worker who wishes to make trial of such fencing has largely to rely on the experience gained in field and paddock.

Certain broad principles, of importance to all who intend to use live wires anywhere in the open, may first be stated [1]. It is generally accepted that:—

(*a*) the maximum current output must be effectively limited and controlled. It is the quantity or amperage of current passing through the body that is dangerous, rendering even low voltages lethal if, for example, the subject is standing on wet ground. The amount of current required to cause 'freezing' to the conductor varies with different people but *ten milliamperes* seems to be the maximum permissible in order to avoid it. German wartime regulations allowed only 3 milliamperes per impulse [7];

(*b*) the current should be interrupted long enough for anyone to free himself, and the duration of the charge, or shock period, should not exceed one-tenth of a second. In Germany, a frequency of from 60 to 90 shocks a minute was officially recommended [2], the latter particularly for training livestock. Commercial units generally build to 50 or 60 per minute;

(*c*) the current controller should be reliable and tamper-proof, and

(*d*) anywhere near farms, etc., the fence should be equipped with lightning arrestors, so as to isolate the controlling device and prevent loss of property and livestock.

Considerations such as these, which recognize that the electric fence is a dynamic instrument involving the safety of life and property, have led to regulations in several countries where live fences are finding greatly increased use. The U.S.A. have issued both federal and state regulations—those of the State of Wisconsin being noteworthy amongst the latter—and in Germany regulations were laid down by the VDE during the war, following careful official trials of live-fencing apparatus between 1940 and 1942. So far no such control orders have been issued in the United Kingdom, but manufacturers design their units to comply with accepted standards of safety. Provided reasonable precautions on these lines are taken, users of live fences have considerable latitude as to the electric source and the composition and layout of their circuits. These will now be touched on in turn.

The electric source: Energy is most commonly derived from batteries, dry or wet, an ordinary motor-cycle or car battery giving satisfactory service; but the electric mains, DC or AC, or simple generators actuated by wind or water [2] can serve equally well, the necessary transformers and interruptors being employed. During the war a farmer in Thuringia electrified a small paddock with current generated by a three-foot undershot paddle wheel driving a car magneto [3], a practice also successfully followed in the Black Forest. Battery apparatus should preferably be stored away from buildings, in a protected spot in the open, and suitably boxed or encased.

The life of batteries: The amount of electric energy consumed by an electric fence in good maintenance is practically negligible, for animals speedily learn to avoid contact, and insulator leakage, save in prolonged wet weather over long circuits, should be of small account. Moreover, once animals have learnt that a fence 'stings', experience shows that the current can be switched off for considerable

periods. Millen, writing of a lay-out at Allahabad [5], records as little as one kilowatt consumption per month. The chief danger arises from weeds, grass, or shrubs growing up to the wire and grounding the current, or from the chance overthrow of a support. Barring such accidents, a six-volt accumulator such as those used in cars should last from 5 to 6 weeks on one charge; dry batteries, e.g. four of 1½ volts each, in series, last considerably longer, some 6 to 8 months, but cost much more.

The fence: This can be of the simplest sort, which constitutes, of course, its chief attraction in a world of dear and scarce labour and materials. The prime essential is to ensure satisfactory insulation of the live wire or wires from the ground, so as to maintain the potency of the fence and not waste the electric source. This, as has already been indicated, particularly in forest use, is a problem not so much of structure and design as of maintenance under somewhat unfavourable conditions. To deal with the fence components in turn:—

(1) *The conductor or wire*: Almost any sort of wire will do, whether plain or barbed, new, or old and rusty. On the Continent wire of 1·5-2·5 mm. gauge (e.g. 1·8 Schwedenreute) is commonly used. Barbed wire is sometimes preferred, because the barbs give a greater electrical discharge [4]. Hence it finds favour for corralling and training unruly animals. Any number of lengths of wire may be joined, so long as the ends are clean and twisted tightly together.

(2) *The number of wires and their height from the ground*: For agricultural purposes, a single live wire generally suffices for cattle and horses, two are better for pigs and goats, and seem essential for sheep and where animals of mixed sizes are to be contained; but the lower wire may be left uncharged, with satisfactory results [5]. On uneven ground, two live wires will generally be necessary in any case [6] and in excessively dry conditions, which make for poor conduction, a second or third strand may be strung so as to act as a ground wire. Four live strands effectually kept bears out of an apiary [1].

A common working rule is to fix the wire, if single, at a height equal to two-thirds the height of the animal to be controlled or, say, at 2–3 ft. from ground level for horses and cattle, 1–1½ ft. for sheep, goats and pigs, and about 6 in. for foxes. Where two wires are used, one at face, the other at knee level is recommended for sheep [10]; otherwise heights of about 2 and 4 ft. will do. A fair amount of latitude seems permissible.

(3) *Insulators*: Ordinary porcelain or bakelite insulators may be used, but special light kinds, some having quick-attachment slots, are on the market; also 'unbreakable' types for fences that have frequently to be moved.

(4) *The supports*: As these have only one or two wires to carry they can be very light. Iron ones are easily shorted and wooden posts or stakes are most generally used. In localities of high termite incidence, reinforced concrete posts topped by insulators on iron rods have proved satisfactory for semi-permanent installations [5]. The light load on the posts, and the fact that wires need not be strained taut, render special corner posts unnecessary and erection is a simple, unskilled job. The spacing between posts will depend on the topography, on the number of strands to be carried and the kind of animal being fenced. Anything up to 45 ft. is on record. La Roche advocates that posts be whitewashed, for both domestic and wild animals, as this was found of assistance in training them, by association, to avoid the wire [6].

Gates: These, too, can be of the simplest kind. The commonest pattern incorporates a coil-spring hook and eye into the circuit, the hook side being suitably insulated. At the Allahabad Agricultural Institute the live wire, carrying over 1,000 volts, was threaded through a length of bamboo sheathed in a tyre inner tube [5].

Length of fence effectively chargeable: Granted average equipment and, in especial, adequate insulation, a fence many miles long can be maintained in satisfactory charge [3, 4, 6]. Modern commercial sets employing a 6-volt accumulator and high-efficiency insulators confidently claim a 25 mile electrified circuit.

Although, as already indicated, the forester has lagged behind his brother agriculturist in adapting the electric fence to his needs, the experience of the latter in keeping wild game from his crops by this means carries considerable promise for forestry, at any rate in Europe. A condensed account of this and of certain trials conducted by foresters in wartime Germany and France is given below.

Geyer [7] records a pioneer attempt to keep roe deer from a field of kale during winter by means of a single wire about two feet from the ground, which proved completely successful. He himself experimented unsuccessfully but instructively against a high population of red deer invading fields that were shut in on three sides by forest, using for the purpose four live strands of smooth 2 mm. iron wire at about 13-in. intervals from ground level. The wire, and with it the insulators, got broken frequently by the deer, in part because of early current failures, but some crop protection was achieved. Profiting from this experience Geyer initiated a further trial in a similar forest enclave in the following year, which met with much greater success. A peculiar feature of this second experiment was that the fence had to be constructed to allow roe deer through, in order not to interfere with community hunting rights, while at the same time excluding the red deer and boars. The fence, of some 2,000 yds. perimeter, consisted of three oval strands of steel wire, fixed about 14, 22, and 42 ins. respectively above ground. The lowest was of heavier gauge (against the boars) and the two upper of lighter gauge, all being strung on stout insulators spaced some 36 ft. apart and fixed chiefly to the trunks of trees. Where certain forest rides occurred, the wires were not interrupted, but carried up and over at a height of about 12 ft. or else special gates were put in circuit. After two years' trial Geyer records that the experiment was a decided success, the roe deer learning after a few months to step through the gap (of some 20 in.) deliberately provided between the two upper wires, whereas the red deer were completely excluded from the fields. The few un-gated rides were apparently left severely alone by the deer. The fence's efficacy against boars unfortunately could not be properly tested, for while the fields remained entirely free from boar damage, boars were unusually scarce in the district in both years. In no case was the wire, of either gauge, broken by game nor were any of the insulators. But one lesson learnt was the inadvisability of putting insulators on trees, especially for the uppermost strand and the high traverse over rides. It was found that the tree trunks swayed sufficiently to be continually breaking the strands, which had been fixed to the insulators with special clamps, as well as binding wire.

A purely forest experiment, undertaken in Germany about the same time, but over a period of only ten months' had a less determinate result [8]. The object at that time was to save iron for war purposes and the experiment had State encouragement. Underplantings of beech in 50–100-year-old oak stands were fenced against roe deer over an area of 1·9 hectares with two strands of steel wire strung on insulators some 18 and 32 in. respectively above ground level. The supports were 4-ft. Spruce stakes spaced about 24 ft. apart, with light struts at the corners and less than 3 ft. of the stake above ground. The power source, a trial apparatus made available by an electrical firm and using dry batteries, failed on occasion, but not sufficiently to vitiate the experiment. What tended to do so was the severe mortality among the roe deer in the hard winter of 1941–42 so that the neighbouring control plot (unfenced) got only moderately browsed. At no time, however, were there any signs of deer inside the fence—even during failures of current—but foxes and hares ran through unhindered all the time. Maintenance proved light. During periods of deep snow the lower wire was switched off to prevent earthing and for the same purpose ground vegetation was cut back a few times during summer. Financially, the experiment was voted a success, despite the small perimeter tried; the electric fence cost approximately half a reichsmark per running metre or half the cost of the wire netting ordinarily used against game in that locality.

Finally, a solitary record from France. Massy [9] describes a small-scale attempt to protect young Larch and Scots Pine from heavy roe deer incidence in the Haut Jura, employing the 'Lory' electric fencer. This consisted, essentially, of an accumulator and transformer imparting a high-frequency current to three kilometres (nearly two miles) of wire for a period of 50 days. The accumulator, in a metal case, was slung from a post stuck in the ground and the electrified wires, of 1·5 mm. galvanized iron, were carried on thin stakes, about 25–30 ft. apart, all over the area to be protected, like a sort of spider's web. The experiment, Massy says, proved highly successful, no fresh damage being noticed during the experiment although it persisted all round the protected area. The cost was extremely moderate.

The successes attained with electric fencing in European forests should serve to heighten interest in its application to the very different and challenging conditions to be encountered in the forests of the Empire. Experiments have already begun on the Gold Coast [11] employing a commercial unit, and the first results are awaited. The forester who reads that live fencing can effectively exclude red

and other deer in distant France or Germany, not to mention foxes in America, may well wish to test its efficacy against a quite different set of mammalia—against his local deer and antelope, on sounders of wild pig, on the Asiatic porcupine and, above all, on such massive, gate-crashing animals as the rhino and wild elephant. The experience of the Game Department in Malaya, who appear to have pioneered in this wider field before the Japanese invasion, provides a valuable pointer to possibilities [12]. Employing American fencing units, charging a single live strand up to 10 miles with intermittent shock, they experimented against wild elephant, *seladang* (bison) and deer and evolved different fencing methods according to the type of animal.

Best success against elephant (rated at 75 per cent. or more) was achieved with the live wire running freely through insulators and incorporating a powerful coil spring at five chain intervals. This effectually prevented the wire getting broken when the beast reacted to the shock by plunging forward instead of retreating, even to the point of straightening out the spring. The wire was strung about 4½ ft. from the ground, on posts 33 ft. apart. Against the *seladang* and deer, which were observed not to make a good earth in dry weather, a different set-up eventually gave 90 per cent. efficiency. This consisted of a single live strand, without springs, at 3½ ft. from the ground, and a dead strand 2 ft. lower, earthed every quarter-mile by attachment to a 4-gallon tin of water buried in the ground. The tins had a very small hole to allow the water to percolate into the soil and were replenished at intervals.

These experiments are being resumed by the newly constituted Game Department, using British live-fencing units, and it is hoped will find imitators elsewhere. There are interesting and important possibilities in trials against the monkey-tribe, the porcupine (in his surface travels) and—more doubtfully—the pig, all foes at one time or another, of the forest's welfare.

Malayan experience combines with that from temperate regions to show that the main drawback to electric fencing in forests is the need for constant patrol. On the one hand, against falling branches and trees and—especially in the tropics—the resurgent vigour of the undergrowth; on the other, against the stampeding herd or even individual, in whom instinctive fear may erase all recollection of shock-giving wire. In regions, moreover, of great extremes of climate, and in especial humidity, the electric apparatus may require adjustments from time to time beyond local technical skill. Nevertheless, none of these snags has prevented a promising start being made in a variety of countries; the outlay is small and further experiments in every sort of forest environment seem well worth making.

F. R.

REFERENCES

[1] Farm Fences. *Fmrs.' Bull. U.S. Dep. Agric.* No. 1872, 1940.

[2] BLIKLEN, W. 1943. Stand der Technischen Entwicklung der Elektrozaungeräte. [The Technical development of electric fencing equipment.] *Mitt. Landw.* 58 (144–6).

[3] POSER, O. 1943. Elektrozaungerät mit Lichtnetzanschluss. [Electric fence apparatus attached to the lighting main.] *Mitt. Landw.* 58 (157).

[4] CANO, A. E. 1943. Electrizacion de los alambrados en las explotaciones porcinas. [Electrification of fences on pig farms.] *Alm. Minist. Agric. Argent.* 18, (299–304).

[5] MILLEN, T. W. 1946. Electric fences. *Trop. Agriculturist, Ceylon* 102 (2), (112–14).

[6] La Roche, W. von. 1943. Erfahrungen mit der Elektroeinzäunung. [Experiences with electric fencing.] *Mitt. Landw.* 58 (146–7).

[7] GEYER, W. 1943. Der Elektrozaun als Wildschutz für landwirtschaftliche Flächen. [The electric fence as a game protector for agricultural areas.] *Forstarchiv* 19 (11/12), (253–6).

[8] HENNING, F. W. and AUN, H. 1943. Der Elektrozaun als Wildschutz für Forstkulturen. [The electric fence in forest wild game protection.] *Forstarchiv* 19 (11/12), (257–8).

[9] MASSY, C. 1945. Protection contre les dégâts du gibier. [Protection from wild game.] *J. for. suisse* 96 (12), (235–8).

[10] Electric fencing with timber posts solves wire shortage problem. *B.C. Lumberm.* 26 (12), 1942 (59).

[11] Gold Coast. Report on the Forestry Department for the year 1945–46. Govt. Printing Department, Accra. 1946.

[12] Letter of 9.12.47 from Acting Chief Game Warden, Malayan Union to Imperial Forestry Bureau.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. INFORMATION SERVICES. BIBLIOGRAPHY. MATHEMATICAL AND STATISTICAL ANALYSIS

[692]. 01.5 (410). HOWARD, SIR H., and BEESON, C. F. C. **The Imperial Agricultural Bureaux.** H.M. Forestry Commission, London. 1947. pp. 8. [5th British Empire Forestry Conference, Great Britain, 1947.]

[693]. 01.7. PHIPPS, I. F., PUGSLEY, A. T., HOCKLEY, S. R., and CORNISH, E. A. **The analysis of cubic lattice designs in varietal trials.** *Bull. Coun. sci. industr. Res. Aust.* No. 176, 1944. pp. 40 + tbl.

02. TEXTBOOKS. DICTIONARIES

[694]. 02.1 (410). ACKERS, C. P. **Practical British forestry.** Oxford University Press. 2nd ed., 1947. pp. xviii + 394 + plates. Price 20*s.* net.

The second edition of this book contains two new chapters, one on 'wartime lessons' and another on education, added 'as an enormously increased forest programme is in view with an utter shortage of trained foresters throughout the country'. The chapters on nursery work and on 'the future' have been rewritten, and in order to keep this edition at about the same size as the first, the last chapter of the first edition, dealing with miscellaneous forestry problems and minor subjects, has been cut out. The author hopes that it may be enlarged, brought up to date, and published as a supplementary volume.

[695]. 02.4. VRIES, L. DE. **German–English science dictionary for students in chemistry, physics, biology, agriculture and related sciences.** McGraw Hill Book Company Inc., New York. 2nd ed., 1946. pp. xiv + 558. Price 22*s.* 6*d.*

[696]. 02.41 (729). FANSHAWE, D. B. **Arawak Indian plant names.** *Carib. For.* 8 (3), 1947 (165–81). [E.Span.f.]

04. BLANK FORMS. TABLES

[697]. 04.3 : 09.4. SWABEY, C. **Tabulation and presentation of colonial forestry data.** [? Forest Department, Georgetown, British Guiana.] 1947. pp. 4. [5th British Empire Forestry Conference, Great Britain, 1947.]

Methods of tabulation of statistical and technical forestry data in some colonies are not always satisfactory. It is proposed that a manual be prepared, including accepted standards of classification and suggested forms where no accepted standards exist.

05. PERIODICALS

05.3. *Annual Reports*

[698]. 05.3 (68). SOUTH AFRICA. **Union of South Africa Department of Forestry annual report for the year ended 31st March, 1946.** Govt. Printer, Pretoria. 1947. pp. 30. [E.]

This report is the first to be issued since the abbreviated one issued for the year ending 31st March, 1941. An attempt has therefore been made in both text and tables to cover briefly the more important items of interest in the intervening 5 years that have not already appeared in print.

07. EDUCATION AND RESEARCH

See also *For. Abstr.* 9 (Nos. 878–84).

[699]. 07.1 (410) : 07.2. CHAMPION, H. G. **The Imperial Forestry Institute in 1947.** H.M. Forestry Commission, London. 1947.

pp. 9 + [2]. [5th British Empire Forestry Conference, Great Britain, 1947.]

[700]. 07.1 (595). LANDON, F. H. **Regional forest training.** Malayan Union Govt. Press, Kuala Lumpur. 1947. pp. 5. [5th British Empire Forestry Conference, Great Britain, 1947.]

The history of vernacular forest training in Malaya is sketched and the system described; its extension on a regional basis to all Malaysian countries under British influence is recommended. For training of the intermediate staff the establishment of a regional course in collaboration with Raffles College is thought to be the only solution. *From author's summary.*

[701]. 07.1 (71). SISAM, J. W. B. **Forestry Department of the University of Toronto.** *Pulp Paper Mag. Can.* 48 (7), 1947 (85–90).

The history of the development of forestry education in North America is outlined, and an account is then given of the organization of the Forestry Department of the University of Toronto, with a detailed description of the various courses included in the 4-years undergraduate course, and notes on scholarships, student activities, the Ranger School and the University Forest.

[702]. 07.1 (945) : 81. POWELL, S. H. **Victoria's cradle of forestry.** *Aust. Timb. J.* 13 (4), 1947 (214–7, 257, 259, 261).

An account of Creswick State School of Forestry, Victoria, the education provided, and conditions of service in the Victorian Forestry Service.

[703]. 07.1 (97). **Report of the committee on education.** In *Fifth British Empire Forestry Conference, Great Britain, 1947: Summary Report.* 1947 (55–6). H.M. Stationery Office, London.

The Conference adopted the report of this committee and called the attention of Governments of the Commonwealth to its recommendations, and particularly to the following:— (1) That the provision of adequately trained personnel both in the professional and sub-professional grades is essential to proper forestry. (2) That forestry schools should be created or maintained only under conditions providing the full-time services of an adequate staff with field experience. Professional schools should concentrate on basic principles as a foundation for practical experience. Research by teaching staff and post-graduate students should be facilitated. (3) That inasmuch as exploiting agencies are an integral part of planned management, provision should be made for sub-professional-grade training of personnel necessary to enable such agencies to co-operate fully with the forestry services. (4) That, in many parts of the Commonwealth, recruitment of an adequate trained staff requires pre-selection of forest officer candidates in advance of completion of professional training. In such cases cadet training in the field is an invaluable guide to selection. (5) That qualifying courses on a scholarship basis should be provided for the promotion of outstanding men from sub-professional to professional grades.

[704]. 07.2 (213) : 97.1 : 12.19. BOR, N. L. **Tropical ecology and research.** H.M. Forestry Commission, London. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

A plea for the establishment of institutes for research into land utilization in the tropics, with emphasis on the need for experts in systematic botany as well as pure ecologists in such institutes. They should provide courses of instruction not only for research officers in the forest and agricultural departments of the colony, but also for those whose business is civil administration.

[705]. 07.2 (48). JAHN, E. C. **Scandinavian research organizations.** *Paper Tr. J.* 124 (21), 1947 (41–6). P.R.

[706]. 07.2 (548.7). HOLMES, C. H. **A decade of silvicultural research in Ceylon 1937–1946.** Ceylon Govt. Press, Colombo. 1947. pp. 7. [5th British Empire Forestry Conference, Great Britain, 1947.]

[707]. 07.2 (596–9). CARTON, P. L'œuvre de l'Institut des Recherches agronomiques et forestières de l'Indochine, au cours de la période 1925–1943. **[The work of the Agricultural and Forest Research Institute of Indochina, 1925–43.]** *Agron. trop.* 1 (3/4), 1946 (115–24). [F.]

09.1. *Forest History*

[708]. 09.1 (421–8). LENNARD, R. **The destruction of woodland in the eastern**

counties [of England] under William the Conqueror. *Econ. Hist. Rev.* 15 (1/2), 1945 (36–43). O.B.

09.2. *Pre-history. Pollen Analyses, etc.*

[709]. 09.2 (795). HANSEN, H. P. **Post glacial vegetation of the northern Great Basin.** *Amer. J. Bot.* 34 (3), 1947 (164–71). [Oregon State College, Corvallis, Ore.] O.B.D.

Pollen analysis indicates that during the late Pleistocene and early postglacial periods forests covered a greater area of the Great Basin in Oregon than at present, owing to the moister climate that persisted for some time after glacial retreat in the north. As the postglacial climate became warmer and drier the forests apparently retreated. The maximum contraction was probably reached during the warm dry interval between 8,000 and 4,000 years ago. Since then the forests have slightly expanded but have never regained their early postglacial extent. The place of Lodgepole Pine, Western White Pine, and Western Yellow Pine in the postglacial vegetation as indicated in the pollen profiles, is briefly discussed.

09.4. *Forest Statistics*

See also *For. Abstr.* 9 (Nos. 697, 885, 1081, 1084, 1387–9, 1394).

[710]. 09.4 (519) : 09.7. MELIS, P. E. **The forestry situation in Southern Korea.** *Rep. Brit. Intell. Obj. Sub-comm.* BIOS/JAP/PR/907, 1946. pp. 27. P.R.

In southern Korea 40 per cent. of the total land area is forest. The dependence of a dense population on forest products necessitates its intensive management. Forty-four per cent. of the forest is managed for the production of firewood. Other important products are charcoal, timber for building, railway sleepers, boxboards. The forest soils are unstable and extensive planting and terracing has to be done. At present 30 per cent. of the forest land needs replanting. The report gives an account of the system of forest management, administration, planning, etc., and tabulates figures for firewood, charcoal, timber production, sawmill capacity, etc. A glossary of the principal Korean species is included.

[711]. 09.4 (52) : 09.7 : 22 : 32 : 60.31 : 81. **The imperial forests of Japan.** *Rep. Brit. Intell. Obj. Sub-comm.* BIOS/JAP/PR/908, 1946. pp. 58 + plates.

The Japanese imperial forests, which are administered by the Imperial Forestry and Estates Bureau, have existed as such since about 1888 and consist of 1,294,529 ha. of forest land, two-thirds of which are in Hokkaido, and one-third in northern and central Honshu. Natural forest forms 87 per cent. of the whole. Most of the imperial forests are in remote and mountainous areas, where they are important for controlling erosion. About 35 per cent. are commercially inaccessible. The rest are intensively managed on a sustained-yield basis and produce about 3·5 per cent. of Japan's total forest products, mainly in the form of sawlogs, pulpwood, veneer logs, mining timbers, railway sleepers, poles, firewood and charcoal. The report gives (*a*) full details and statistics relating to tree species, volume of standing timber, forest management and administration, average annual cut and production, logging methods and equipment, timber distribution, etc.; (*b*) separate accounts of the management, production and administration of the Amagi and Kiso Imperial Forests and the Tarumai Branch Office Forest in Sapporo District, Hokkaido.

[712]. 09.4 (52) : 09.7. **Estimate of the forestry situation in Hokkaido.** *Rep. Brit. Intell. Obj. Sub-comm.* BIOS/JAP/PR/ 667 [*n.d.*] pp. 36 + iv. P.R.

Two-thirds of Hokkaido island is under forest, one-half of both area and volume being national and state forest. Timber is available both from uncut stands and from stands where cutting has been light. The major forest industries are lumber, veneer and plywood, and miscellaneous products include pulp, paper, mine and ship timbers, and tanning bark. Production is retarded by shortages of labour, machinery, chemicals and glues and by the breakdown of transport. The total cut expected for 1946 was 5,367,000 cu.m.

[713]. 09.4 (73). UNITED STATES. **Basic forest statistics for the United States as of beginning of 1945. Preliminary data from the reappraisal project.** U.S. Forest Service, Washington, D.C. 1946. pp. [2] + 10 tbls.

Tables give statistics of the following, for

states and regions:—land area and its major uses, area of commercial forest according to character of growth; board-foot volume of sawtimber, and cubic-foot volume of saw and pole timber for softwoods and hardwoods; ownership of commercial forest land and of the sawtimber on it; current annual growth and annual drain; and volume of sawtimber by species (for main softwoods).

[714]. 09.4 (936). LUKE, R. H. **An estimate of the timber resources of New Britain.** *Aust. For.* 10, 1946 (72–80).

Includes tables showing area and estimates of volume for various localities; distribution, frequency and volume of trees in an acre of average rain forest (with vernacular and scientific names); detail of 25 plots of merchantable *Eucalyptus deglupta* [*naudiniana*] in pure or nearly pure stands; and estimated volume of timber, by species, in accessible merchantable stands, the total of which is about one million super. ft. Hoppus.

[715]. 09.4 (97) : 35 : 98. **Empire forests and the war. A digest of statistics prepared for the Fifth British Empire Forestry Conference.** H.M. Stationery Office, London. 1947. pp. 18.

This digest was prepared by the Central Statistical Office in collaboration with the Forestry Commission and the Board of Trade, from statistics supplied by the various forest authorities. The aim of the digest is to show in broad outline the position of Empire forests before and during the recent war. All the series appearing in this digest are shown in greater detail in the separate statements supplied by each forest authority. The tables of statistics relate to the following subjects:—forest area and population in 1938, volume of standing timber in exploitable forest in 1938, output of timber, roundwood, pulpwood and softwood in principal producing countries, output of hardwood in principal producing countries, annual imports and exports of wood and wood products, value of gross annual softwood imports from different sources, value of gross annual hardwood imports from different sources, value of gross annual imports of derivative products from different sources and minor forest products imports and exports. These are given, so far as data allow, for each of the years 1939 to 1945 inclusive, with the average for the period 1934–8 for purposes of comparison. The figures for forest area relate to (1) exploitable or potentially exploitable forest, and (2) 'other land classed as forest' or non-productive forest. The latter includes non-exploitable forest which owing to physical conditions or other reasons has no prospect of being worked, areas serving only a protective purpose, and areas permanently destroyed as forest but not yet converted to other land uses. The statistics of the volume of standing timber and increment relate only to forests classed as exploitable and species of timber which are economically exploitable. Output statistics distinguish timber, roundwood, pulpwood, firewood and charcoal.

09.7. *Monographs of Individual Forest Regions*

[716]. 09.7 (45). SEXTON, A. N. **Some Mediterranean forests: II. Southern Italy.** *N.Z. J. For.* 5 (3), 1946 (177–82).

The high forest consists of a mountain type above 2,600 ft. with *Pinus nigra* var. *calabrica*, *Fagus sylvatica*, *Abies alba*, *Castanea sativa* and *Quercus* spp. as the chief constituents, mainly in pure stands, sub-montane forests of Oak and Chestnut with some Chestnut coppice, and coastal forest of *Alnus glutinosa* on river flats and *P. halepensis* on sandhills and gravel fans. The different forest types, their utilization and management are described, with particular reference to *P. nigra* var. *calabrica*. Though the Pine, Fir and Beech forests are now the most important commercially, the Beech and Chestnut coppice and the Chestnut fruit forests are probably of greater importance in the region's economy, firstly for fuel and grazing, secondly for vineyard stakes and poles, and thirdly as food. Oak forests are also important sources of charcoal, firewood and grazing. The coastal *P. halepensis* is of little consequence. Ownership of the forests is almost equally divided between the communes, private owners and the state, but all cutting is controlled by the Forest Service. *From author's summary.*

[717]. 09.7 (469). KNUCHEL, H. Portugal —ein Land im Aufstieg. [**Portugal—a land on the up-grade.**] *Schweiz. Z. Forstw.* 98 (8/9), 1947 (305–18 + plates). [G.f.]

The writer visited Portugal in 1946 and compares the forestry situation with that at the

time of his previous visit in 1922. [Cf. *For. Abstr.* 8 (No. 173).]

[718]. 09.7 (496.5). MICHELANGELO, M. Il problema forestale Albanese. [**The Albanian forest problem.**] *Riv. for. ital.* 2 (10), 1940 (5–22). [It.]

[719]. 09.7 (51) : 32 : 33.1. NUNN, G. W. **Notes on forestry in China.** *Aust. For.* 10, 1946 (30–5).

Consists of two parts: (1) forestry and logging in Chekiang province; (2) forests and lumber in Kwangtung province. In Chekiang the Chinese, for sound economic reasons, are growing logs on a rotation of about 30 years, and over some millions of acres of mountainous country, sound forestry practice is being followed and there is an approximation to sustained yield with age gradations from 1 to 30 years. Soil erosion is practically non-existent in spite of steep slopes and high rainfall. Extraction is carried out by hand skidding of logs down the slopes to the rivers, in which the forest workers are very skilful. The Chinese in this province are adept in the use of round timber in all construction work and there is little call for sawn timber. Forests consist mainly of *Pinus massoniana*, *Cunninghamia lanceolata*, Bamboo and *Cryptomeria japonica*. Kwangtung is largely deforested but afforestation is in progress.

[720]. 09.7 (54) : 31.0 : 34. **Forest wealth of Indian states.** *Indian For.* 72 (11), 1946 (529–31). [Director of Public Relations, Chamber of Princes, Council House, New Delhi.]

According to the latest available figures, the total forest area in Kashmir is 10,288, in Hyderabad 9,485, in Mysore 4,422, in Gwalior 3,279, in Indore 2,624, in Bastar 2,603, in Travancore 2,402, and in Mayurbhanj 2,130 sq. miles. The present paper briefly summarizes the main forest types, the chief commercial timbers and their uses, minor forest products, and various advances in forest practice (establishment of nurseries, experimental forests, etc.) in these states.

[721]. 09.7 (596–9). La situation des forêts de l'Indochine française. [**The present condition of the forests of French Indo-China.**] *Les techniques du bois* 1, 1947 (41–50). [F.]

A report by the Indo-China Forest Service. The principal forest types are first described—(1) Mangrove, (2) Tram (*Melaleuca leucadendron*), (3) Pine (*Pinus merkusii* and *P. khasya*) (all pure stands), (4) dense and (5) open mixed forest—and some account given of their evolution. The greater part of the article consists of a fairly detailed account of methods of logging, transport, conversion, preservation and manufacture at present in use.

[722]. 09.7 (729.2) : 12.19.2 : 3 : 90. SWABEY, C., and LEWIS, C. B. **Forestry in the Cayman Islands.** *Bull. Developm. Welfare W. Ind.* No. 23, 1946. pp. 31.

Includes a general description of the islands, and brief surveys of the vegetational types, the utilization of timber and minor forest products, imports and exports, forest legislation, and general forest policy.

[723]. 09.7 (85). HODGE, W. H. **The plant resources of Peru.** *Econ. Bot.* 1 (2), 1947 (119–36).

Includes brief accounts of the temperate montane forest and the tropical rain forests with some details of timber and latex-bearing trees, Palms and Bamboos.

[724]. 09.7 (941) : 12.26–8. HARTLEY, A. E. **The Jarrah and Karri forests of Western Australia.** *Aust. Timb. J.* 13 (5), 1947 (288–90, 296).

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

11.11. Air Temperature

[725]. 11.11 (675). VANDENPLAS, A. La température au Congo belge. [**Temperature in the Belgian Congo.**] Ministère des Colonies, Direction de l'Agriculture, 7 Place Royale, Brussels. 1947. pp. 194. [F.]

A comprehensive study, including some 80 pages of tables. It is divided as follows: (1) temperature in general, (2) annual and monthly distribution of temperatures, (3) principal characteristics of temperature in the Congo,

(4) temperatures in, and on the surface of the soil.

11.2. *Climate and Microclimate*

See also *For. Abstr.* 9 (Nos. 1338–9).

[726]. 11.2 (714). VILLENEUVE, G. O. **Climatic conditions of the Province of Quebec and their relationship to the forests.** Meteorological Bureau, Department of Lands and Forests, Quebec. 1946. pp. 123 + maps.

Meteorological data obtained during 10 years at more than 200 stations are analysed. The author concludes that climatic elements, particularly temperature and precipitation, are the primary factors controlling the distribution of forests in the tundra and hardwood forest regions. In the coniferous forest region, the vegetation in relatively northern latitudes or at high altitudes appears to be more dependent on climate than on soil, but soil is the decisive factor in forest distribution over the rest of the coniferous forest region. In the mixed forest region, climate and soils are of equal importance. *From author's digest.*

11.4. *Soil*

11.43. Biology of Soil, including Mycorrhiza

[727]. 11.43.1 : 12.21. GILMAN, J. C. **A manual of soil fungi.** Iowa State College Press, Ames, Iowa. 1945. pp. xi + 392. Price $5.00 (27*s.* 6*d.*)

Brings together from many scattered sources the descriptions of the fungi which have been reported as isolated from the soil, together with keys to aid in identifying the fungi in hand. In general the arrangement of the fungi has followed the scheme set forth by Lindau in Engler and Prantl, *Die natürlichen Pflanzenfamilien. Actinomycetes* and *Zoopagaceae* have been omitted. *From author's introduction.*

11.44. Litter. Surface Humus

See also *For. Abstr.* 9 (No. 1337).

[728]. 11.44 (421–8). PEARSALL, W. H. **Leaf-fall in Hertfordshire woodlands.** *Trans. Herts. nat. Hist. Soc.* 22 (3), 1945 (97–8). O.R.S.

Data are given showing the amount of dead material (leaves and twigs) falling per square metre in coppiced woods with mature Oak (*Quercus sessiliflora*) standards near Stanstead-bury, Herts, during October to December. The figures suggest that the soil gains at least 1,500 g. of organic matter per sq.m. during this period.

[729]. 11.44 : 11.42 : 12.25. FORSYTH, W. G. C. **The characterization of the humic complexes of soil organic matter.** *J. agric. Sci.* 37 (2), 1947 (132–8). O.R.E.

Studies on the fractionation of the humic precipitate of soil organic matter with aqueous, anhydrous and alcoholic bases. The materials investigated were heather (*Calluna vulgaris*), raw humus, gardeners' 'turf' soil, cottongrass peat, Pine raw humus, cabbage compost, and fresh grass. The yields of humic precipitate from the various materials, expressed as percentages of the total organic matter on an ash-free basis were: heather humus 43·0, soil 24·8, peat 15·1, Pine humus 10·4, cabbage compost 6·4, fresh grass 1·5. The purified humic acids, expressed as percentages of total original organic matter were: heather humus 25·0, soil 10·7, peat 10·9, Pine humus 6·8, cabbage compost 3·9, fresh grass 0·4.

11.47. Maintenance of Favourable Soil Conditions

[730]. 11.47.11 : 13.15 : 13.2 : 21.32. WALLIHAN, E. F. **Growth rate of trees in the vicinity of woodchuck burrows.** *J. For.* 45 (5), 1947 (372–3).

During a survey of hardwood plantations in New York State it was noticed in several plantations that one or two trees had grown much faster than any of the others and that in each such case there was a woodchuck burrow near by. In order to discover whether this increased rate of growth was due to increased nutrition derived from woodchuck droppings, paired samples of leaves were taken from trees in three of the plantations concerned; one sample was taken from the tallest tree near the burrow, the other from the nearest tree of the same species whose height was about average for the plantation. The results of analysis

of these samples is shown in the table. The high correlation between growth and nitrogen content of the foliage is strong evidence that an increased supply of this element was an important cause of the higher growth rate of trees nearest to woodchuck burrows.

Tree species	Mean ht. of spp.	Height in ft.		N in leaves	
		A	B	A	B
				per cent.	per cent.
Prunus serotina . .	5 ft. 9 in.	18	6	2·57	2·10
„ „ . .	7 ft. 5 in.	12	7	2·22	1·78
Fraxinus pennsylvanica .	4 ft.	12	4	2·69	2·35

[731]. 11.47.13 : 21.32. LUNT, H. A. **The response of hybrid Poplar and other tree species to fertilizer and lime treatment in concrete soil frames.** *J. agric. Res.* 74 (4), 1947 (113–31). [Connecticut (New Haven) Agric. Exp. Sta.] O.R.E.

The principal facts brought out in this work are that (*a*) Red Pine (*Pinus resinosa*), Norway Spruce [*Picea abies*], White Spruce (*Picea glauca*) and Red Oak (*Quercus falcata*) were adversely affected by lime, but Sugar Maple (*Acer saccharum*), White Ash (*Fraxinus americana*) and hybrid Poplar (*Populus nigra* ♀ × *P. laurifolia* ♂) were benefited by it; (*b*) response to nitrogen and phosphorus was low in the case of Red Pine and Norway Spruce, but medium to high for all other species; (*c*) response to potassium, in spite of the low level of available potassium in the untreated soil, was negative in most cases.

The rapid growth of hybrid Poplars would seem to make them ideal to use in nutritional studies of forest trees, but the writer is of the opinion that the requirements of this or any other fast-growing tree may be quite different from those of a slow grower, hence results obtained with the former should not be applied to the latter without due caution. *From author's summary.*

11.6. *Hydrographical Conditions. Water and Soil Conservation*

See also *For. Abstr.* 9 (Nos. 750–2, 857–60, 870–1, 1378).

[732]. 11.6 (68) : 91.3. WICHT, C. L. **Hydrological research in South African forestry.** [Department of Forestry, Pretoria.] 1947. pp. 18 + plates. [5th British Empire Forestry Conference, Great Britain, 1947.]

Progress made at the Jonkershoek Forest Influences Research Station in the Cape Province, the establishment of which was recommended by the Empire Forestry Conference in 1935, is described. A second research station, being established at Cathedral Peak in Natal, is briefly referred to. Surveys of site factors, technique of observations on rainfall, streamflow, net rainfall under forest canopies, infiltration, evaporation and transpiration, treatments being investigated, and design and interpretation of streamflow experiments, are discussed. Jonkershoek is a fairly comprehensive research station, but good results can be obtained from less complete stations. The minimum requirements for comparing two treatments are that two small catchments should be selected for gauging and that at least one shielded rain gauge should be erected. Preferably, however, 4 or 5 catchments should be gauged at one centre, to permit some replication of treatments. It is recommended that this type of research should be greatly extended, not only to test the effects of various forms of land management, but also to provide essential data on water supplies.

[733]. 11.62 : 11.13 : 11.14.3 : 91.3. ISAAC, L. A. **Fog drip and rain interception in coastal forests.** *For. Res. Notes Pacif. Nthwest. For. Range Exp. Sta.* No. 34, 1946 (15–6).

Data are given showing the amount of precipitation recorded by rain gauges set in the open and under the coniferous canopy at various stations in the Oregon coastal 'fog belts' situated up to 5 miles inland. Light rains were often not recorded on the gauges under the coniferous canopy, as they were intercepted by the leaves and often evaporated without reaching the ground. Fog, however, was collected and condensed by the tree crowns and

dripped to the ground in appreciable quantities when no moisture was caught by rain gauges in the open. Recorded rainfall under tree crowns in a valley 5 miles inland was one-third less than in the open. On a ridge to the north, an equal distance inland, the variation was not so great; but conditions were reversed on a ridge only 2 miles from the ocean, where precipitation was one-quarter greater under the trees than in the open, owing to the greater amount of 'fog drip'.

[734]. 11.62 : 60.32. MUNNS, E. N. **Forest management on municipal water source areas.** *J. For.* 45 (5), 1947 (315–22).

A review, on conventional lines, of the objects and methods of management of forest cover on catchment areas supplying large centres of population.

[735]. 11.26.1 : 11.33. LUTZ, J. F., and HARGROVE, B. D. **Soil movement as affected by slope, discharge, depth and velocity of water.** *Tech. Bull. N.C. agric. Exp. Sta.* No. 78, 1944. pp. 32.

By means of an adjustable experimental water channel simulating a field plot undergoing sheet erosion, a study was made of the relation between (*a*) slope, depth and velocity, (*b*) slope and carrying capacity, and (*c*) depth and carrying capacity. A nomograph was constructed by which the amount of erosion can be determined mechanically for any given discharge and slope.

[736]. 11.62.11 : 01.2. [FORD-ROBERTSON, F. C.] **Quoth the Pandit.** *Indian For.* 73 (1), 1947 (30–6).

Sketches a revised classification of erosion terminology, including a few new terms deemed necessary.

[737]. 11.62.11 (542). HALL, W. T. **Erosion in the Jumna and Chambal ravines.** *Indian For.* 73 (5), 1947 (195–8). [Seventh All-India Silvicultural Conference, Dehra Dun (1946).]

A summary of the report of a United States Soil Conservation Officer who visited India in 1945, with comments by Indian Forest Service Officers. The main points of the report are:—(1) The area is so highly eroded that it should not be grazed at all. (2) The proper land use for these areas is fuel production. (3) Control of head erosion in these gullied areas cannot be accomplished by vegetation alone. The whole erosion system or unit must be dealt with and this includes a strip of the upper, level, cultivated lands which are the sources of water that cause the gullies. Cultivation should not be permitted near the overfalls at the head of the gullies and farther back a system of contour farming including contour bunding should be practised. (4) Control measures should include gully plugging. (5) Cultivation of steep and rough areas in the ravines should not be practised. Cultivation should only be attempted in the broad nullahs.

Comments of I.F.S. officers on items (1)–(4) express general agreement with the report in theory, though they point out practical difficulties in Indian conditions. On item (5) they combine in condemning the suggestion that cultivation should be allowed in broad flat-bottomed valleys; cultivation is impossible in India without cattle, and it is agreed that no grazing is advisable in these areas; moreover, the broad nullahs are the most suitable sites for fuel plantations.

[738]. 11.62.11 (665). SUDRES, A. La dégradation des sols au Foutah Djalon. [**Soil degradation in the Foutah Djalon [French Guinea].**] *Agron. trop.* 2 (5/6), 1947 (227–46). [F.]

Describes the topography, climate and vegetation of the area, analyses the causes of soil degradation, and suggests methods of control, including forest reservation and reforestation.

[739]. 11.62.11 (675). TONDEUR, G. La conservation du sol au Congo belge. [**Soil conservation in the Belgian Congo.**] *Bull. agric. Congo belge* 38 (2), 1947 (211–14). [F.f.flem.]

The author, who was sent to America to study the methods of the U.S. Soil Conservation Service, surveys the needs and difficulties in the way of soil conservation in the Belgian Congo, with special reference to the social organization and customs of the native population, and the present state of scientific knowledge.

[740]. 11.62.11 (747). LAMB, J., ANDREWS, J. S., and GUSTAFSON, A. F. **Experiments in the control of soil erosion in southern New York.** *Bull. Cornell agric. Exp. Sta.* No. 811, 1944. pp. 32.

Demonstrates, with quantitative data covering several years of observation, the value of grass and other crops, surface residues, trashy and strip cultivation, fertilizers and contour practices in reducing soil and water losses and raising crop yields. A special 6-year study of a stony, fallow, 20-per-cent. slope indicates that removal of all stones more than 2 in. across nearly doubles the water loss and trebles the soil loss.

[741]. 11.62.11 (931). BIGGS, C. **Forests and erosion.** Résumé of Presidential Address given at the Annual General Meeting of the N.Z. Institute of Forestry, June 22nd, 1946. *N.Z. J. For.* 5 (3), 1946 (210–4).

Résumé of the causes of erosion. Restoration of the native vegetation through a policy of protection is regarded as the best cure.

[742]. 11.62.11 (94) : 96.1. GALBRAITH A. V. **The place of forestry in land utilization in Australia with special reference to soil and water conservation.** [Forests Commission, Melbourne.] 1947. pp. 11. [5th British Empire Forestry Conference, Great Britain, 1947.]

[743]. 11.62.11 (949) : 12.25 : 23.22. JOHNSTON, E. P. **Soil conservation and forestry in the Australian Capital Territory.** *Aust. For.* 10, 1946 (9–16).

An outline of the nature and causes of erosion in the Australian Capital Territory with a description of the measures being taken to check and prevent it, with particular reference to recent forestry operations. Details are given of preparatory measures and planting methods for the establishment of *Pinus radiata* on overgrazed, eroded land. Owing to the marginal climatic conditions for *P. radiata* it is essential to plough former grazing land in order to reduce competition from grass. Three furrows, not less than 9 in. deep, are ploughed contourwise for every row. The speed and cost of ploughing with different types of tractor and fuel are analysed. After the main area has been ploughed, two rows are ploughed along the banks of the gullies, one turning the sod towards the gully and a second along the ends of the rows turning the sod away from the gully and thus sealing the ends of the furrows. Before planting in ploughed lines it is necessary to break the sods up, and in order to check water flowing along the last furrow a spadeful of earth is placed in the furrow. A spadeful of earth on the windward side of the seedling also gives it some protection against the wind until it has become established.

[744]. 11.62.3 (792) : 11.62.11. CRADDOCK, G. W. **Salt Lake City Flood, 1945.** *Repr. from Proc. Utah Acad. Sci.* 23, 1945–46 (56–61).

[745]. 11.62.31 : 91.3 (931) : 21.0 : 12.25. SMITH, J. L. H. **Exotic forests and runoff.** *N.Z. J. For.* 5 (3), 1946 (231–2).

Extensive 16-year-old plantations of *Pinus radiata* in the Auckland Conservancy are said to be drying up the streams rising in the catchment area of the forest. Under the heavy canopy, the natural ground cover of Manuka scrub has almost completely given way to a thick layer of needles. In a neighbouring catchment planted at the same time with *P. laricio*, where the canopy was not yet sufficiently dense to suppress the scrub entirely and much less litter has accumulated, the rise in streamflow, after rain, began at the same time but was more rapid and reached a greater height. At Tairua Forest on the Coromandel Peninsula, where an area of low bracken and Manuka was planted with *P. radiata* about 15 years ago, a similar drying-up of streams is reported.

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11.1. *Metabolism. Plant Constituents. Photosynthesis. Sap Flow. Transpiration. Growth Substances*

[746]. 12.11.11 : 21.32 : 42.5. **Tree physiology.** *Rep. imp. for. Inst. 1945–46*, 1947 (10).

A number of analyses have been made of needle samples from representative trees and seedlings showing different degrees of growth vigour, with a view to investigating possible correlations between mineral concentrations in the tissues (e.g. Ca, Mg, K, N, P, Fe, Mn) and growth. This technique shows promise as a practical procedure for investigating the nutritional status of the tree with particular reference to mineral deficiencies and toxicities.

[747]. 12.11.12. IVANOV, L. A., and KOSSOVICH, N. L. Polevoy metod opredeleniya fotosinteza v assimilyatsionnoy kolbe. [**A field method of determining photosynthesis in the assimilation flask.**] *Bot. Zh. S.S.S.R.* 31 (5), 1946 (3–12). [Russ.e.] [S. M. Kirov Forest-Technical Academy, Leningrad.] O.B.D.

[748]. 12.11.12 : 11.1. HOWARD, A. L. **Does the moon affect trees?** *Ctry. Life, Lond.* 97 (2528), 1945 (1123). O.B.

Native superstitions and at least one practical experiment suggest that in both moderate and tropical climates the flow of sap in trees may be affected by the waxing and waning of the moon.

[749]. 12.11.12 : 12.11.11 : 21.32. ZHEMCHUZHNIKOV, E. A. **Osmotic pressure and the composition of the cell sap in arboreous plants of different salt resistance under increasing soil alkalinity.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 52 (7), 1946 (627–30). [E.] [The A. M. Gorky Pedagogical Institute, Omsk.] O.R.S.

No connexion could be discovered between salt resistance and osmotic pressure or between salt resistance and the amount of dry matter in the sap of the woody species tested. In some species, however, the rate of accumulation of chlorine ion in the leaves was shown to be correlated with the degree of salt resistance. Less resistant species, such as *Prunus besseyi*, Pyramidal Poplar, and American Maple, showed a more rapid accumulation of chlorine ion than more resistant species, such as *Robinia pseudoacacia*, *Prunus armeniaca*, and *Pyrus baccata*.

[750]. 12.11.14 (68) : 21.2 : 21.1. HENRICI, M. **The transpiration of different plant associations in South Africa.** *Sci. Bull. Dep. Agric. S. Afr.* No. 244, 1946. pp. 35.

The investigation deals with transpiration from the ecological point of view. On the whole, it has been found that tree associations have a lower transpiration per unit fresh matter of leaves than grasses. Amongst associations the members differ considerably in their power of transpiration. Yet the dominating species, particularly sclerophyllous species, are characterized by a small power of transpiration. The average daily values of water loss on hot, clear summer days in the Drakensberg may vary by 800 per cent. for, say, *Podocarpus latifolius* and *Buddleia salvifolia* growing only a few hundred yards from each other.

The habitat has a large influence on transpiration power. The average transpiration per unit fresh leaves is somewhat higher in the Drakensberg than at Pretoria, and is definitely lower in the dry Orange Free State. Yet when the same genera or even the same species are investigated in the different climates under optimum conditions, the maximum values scarcely differ. It is clear that the factors restricting transpiration are very different in the various climates. In the sour mountain-grassveld or in the 'Ndema forest of the Drakensberg, the very high relative humidity, often mist, causes zero values, especially early in the morning. At Fauresmith the low relative humidity inhibits transpiration, this being particularly noticeable in the afternoon of hot summer days. In winter the temperature early in the morning usually depresses transpiration, presumably not as such, since radiation is strong enough, but by preventing a regular supply of water from the roots. In extreme cases real dormancy of the trees can be observed.

If, broadly speaking, the potential transpiration of a tree in the Orange Free State is the same as for the same species or a nearly related species in the Drakensberg it is understandable that the espacement of trees in the dry climate must be very open.

Sixteen tables are appended. *From author's summary.*

[751]. 12.11.14 (68) : 21.2 : 21.0 : 12.26–8. HENRICI, M. **Transpiration of South African plant associations. Part II. Indigenous and exotic trees under semi-arid conditions.** *Sci. Bull. Dep. Agric. S. Afr.* No. 248, 1946. pp. 41.

Investigations suggest that the transpiration of indigenous trees in South Africa is not less than that of exotic genera like *Eucalyptus*, *Pinus* or *Acacia*, which have been largely used in afforestation. Among the introduced species the Wattles showed the highest average hourly transpiration per unit of area, but some of the indigenous trees (*Burkea*, *Zizyphus*, *Celtis*) showed equally high values. Owing, however, to the large size and rapid growth rate of some of the exotics, such as Eucalypts, a comparatively greater amount of water is used per tree in

a given time. In most cases it is not the transpiration as such which precludes plantations of such species; the espacement and size of the trees is the deciding factor.

Observations on *Eucalyptus* plantations in Italy indicate that with a higher rainfall or wetter soil the competition of the roots for water is much less acute than in South Africa, and there is plenty of undergrowth in the Italian plantations. The water requirements of some *Eucalyptus* species are very large, and even in wet soils in Italy a spacing of 2½ metres is too close to allow good growth. The paper is amply illustrated with graphs and tables. [Cf. *For. Abstr.* 9 (Nos. 732, 745).]

[752]. 12.11.14 : 12.26–8. DANILOV, M. D. **Winter transpiration in one-year-old shoots of trees of *Quercus robur* differing in age.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 52 (5), 1946 (441–4). [E.] [The M. Gorki Silvicultural Institute in the Volga Region, Ioshkar-Ola.] O.R.S.

Determinations of the winter transpiration rate of one-year-old top shoots of Oak (*Quercus robur*) trees of different ages show the following general trend: the transpiration gradually falls with the age of the tree from one year to approximately 20 years; 20- to 40-year-old trees show smallest transpiration losses; while in trees over 80 years old the rate of transpiration again increases sharply.

The winter drying of shoots of Oak cannot be explained solely by the degree of transpiration losses. It depends also on the compensatory water supply available from the branches and roots during the winter.

[753]. 12.11.15 : 21.12 : 12.26–8. SUKHORUKOV, K., and BOLSHAKOVA, N. **Free and bound hormone of cell division in plants.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 53 (5), 1946 (471–4). [E.] [Laboratory of Photosynthesis, Academy of Sciences of the USSR., Tomsk State Univ.] O.R.S.

Much of the hormone of cell division is found in a bound state in the winter leaf buds of the very frost-resistant *Betula verrucosa*, whereas in the buds of the less frost-resistant *Tilia cordata* the hormone is free. The relation between the free and the bound hormone in *Tilia* varies with temperature, in *Betula* it does not.

[754]. 12.11.15 : 21.8 : 12.26–8. DANILOV M. D. **On the breaking of winter rest b buds of woody plants.** *C.R. (Doklady) Aca Sci. U.R.S.S.* 53 (3), 1946 (267–9). [E.] [Th Near-Volga Institute of Silviculture, Ioshkar Ola.] O.R.S.

Pulp from 'awakened' buds of Oak an Birch and the germinating coleoptiles of oats when introduced under the bark of one-year old shoots of 5- to 10-year-old Ash, noticeabl stimulated the breaking of dormancy of th Ash buds. The stimulating agent appears t be of the hormonal type, and its influence ca be transmitted either up or down the shoot.

12.11.2. *Reproduction. Propagation. Growth. Development*

See also *For. Abstr.* 9 (No. 850).

[755]. 12.11.21 : 12.26–8. EKLUNDH-EHRENBERG, C., EULER, H. VON, and HEVESY, G. **Note on the number of pollen grains identified in the fruit of the Aspen.** *Arkiv Kemi, Mineral. Geol.* 23B (5), 1946, pp. 5. [E.e.] [Institute of Research in Organic Chemistry, Univ. of Stockholm.] O.R.S.

Aspen pollen containing radio-active phosphorus was used to fertilize female branches, and the seeds thus produced were examined for radio-activity. Results indicate that in the formation of a seed of Aspen not only the material of the fertilizing pollen grain participates, but also that of a further 7 grains.

[756]. 12.11.22 : 23.26 : 12.26–8. STAHEL, G. **A new method of rooting cuttings of *Hevea* and other trees.** *Trop. Agric.* 24 (1/3), 1947 (4–6).

Cuttings of *Hevea* and some other light-demanding tropical trees cannot be successfully rooted in the usual type of closed propagator on account of the low light intensity. By removing the lids in the day time and keeping the cuttings continuously sprayed with water, the light may be increased up to 50 per cent. of full sunlight with beneficial results. In an experiment where CO_2 was added to the atmosphere round the cuttings, there was increased callus formation, but fewer cuttings rooted than in the controls. *From author's summary.*

[757]. 12.11.22 : 12.26–8. KOMISSAROV, D. A. **Rooting of cuttings of *Quercus suber* L. treated with chemicals.** *C.R. (Doklady)*

Acad. Sci. U.R.S.S. 52 (4), 1946 (353–6). [E.] [Central Research Institute for Silviculture.] O.R.S.

The most efficient root stimulant was α-naphthalene-acetic acid. Good results were obtained with heteroauxin, anthranilic acid, nicotine sulphate and anabasine sulphate. Given at optimum doses, α-naphthalene-acetic acid also stimulates the development of buds and shoots.

[758]. 12.11.22 : 12.26–8. LUPE, I. Înmulțirea ulmului de Turchestan prin butași de rădăcină și tulpină și prin drajoni. [**The propagation of Turkestan Elm from root and stem cuttings and suckers.**] *An. Inst. Cerc. Exp. for., București (Ser. 1-a)* 9 (1), (1943) 1945 (3–18). [Rum.f.] P.R.

A description of experiments made in Rumania to propagate *Ulmus pumila* from root and stem cuttings and suckers. The remains of stems and roots, etc., left in the nursery after plants had been lifted, were used. Three hundred suckers were set out and 5 different kinds of cuttings were planted in 5 different ways. The tabulated results show that satisfactory plants can be raised from root suckers, truncated pieces of malformed plants and root cuttings of *U. pumila*. There were indications that the number of plants taking root increased with the length of the cutting and was highest with cuttings planted with one end at the surface of the soil. Suckers separated and planted out behaved like seedling plants.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance. Cytology*

See also *For. Abstr.* 9 (No. 837).

[759]. 12.11.3 : 01.6 (431–5 : 45). BUZZATI-TRAVERSO, A. **A bibliography of genetic research published in Italy and Germany, 1939–1945.** *Heredity* 1 (1), 1947 (19–51).

[760]. 12.11.3 (68) : 07.2. SHERRY, S. P. **The potentialities of genetic research in South African forestry.** [Department of Forestry, Pretoria.] 1947. pp. 11. [5th British Empire Forestry Conference, Great Britain, 1947.]

Special conditions applying in South Africa are discussed in the light of their influence upon present and future genetic policy, and the need for a planned programme of genetic research in conjunction with post-war State afforestation is emphasized. Clinal forms of *Pinus taeda* from specific localities in the Southern United States and of *P. pinaster* from Portugal are shown to be superior, under South African conditions, to other clines of these species. Mother-tree selection in *P. radiata* has given promising results, and it has been found possible to isolate vigorous individuals, mainly hybrids (*P. sondereggeri*), by nursery selections of *P. palustris* for vigour. Results of breeding in Pine and tan Wattles are outlined, and data from field plantings of rooted cuttings of *P. radiata* are presented. In conclusion, suggestions are made for a programme of forest genetic research in South Africa. *Author's abstract.*

[761]. 12.11.3 : 12.25 (68). **Seed provenance.** *Rep. Dep. For. S. Afr. 1946*, 1947 (6).

Tests of geographical strains from 15 sources of *Pinus taeda* and 5 sources of *P. caribaea* have been in progress since 1937 in various parts of the Union of S. Africa. Marked and consistent differences in vigour are now discernible between various strains of *P. taeda*, maximum differences in mean height in some trials approaching 100 per cent. Differences in strains of *P. caribaea* in this project are hardly noticeable, but a strain introduced from British Honduras in 1928 and established at Dukuduku in Zululand shows conspicuous superiority over the best strains used for local afforestation, its mean annual increment at 17 years of age being more than twice that of the best strains from the United States available locally. In 1941 precocious seedlings of *P. palustris* were noticed in the nursery at Kwambonambi and a project was established to test their subsequent growth in comparison with normal seedlings. Four years and 8 months later the precocious seedlings showed an average height of 20·4 ft. and a mean d.b.h. of 5·1 in. compared with 13·9 ft. and 3·2 in. respectively for controls.

[762]. 12.11.3 : 12.25 (68). RYCROFT, H. B., and WICHT, C. L. **Field trials of geographical races of *Pinus pinaster* in South Africa.** [Department of Forestry, Pretoria.] 1947. pp. 12 + plates. [5th British Empire Forestry Conference, Great Britain, 1947.]

Replicated field trials with stocks of *Pinus pinaster* Soland. from known localities in Europe and North Africa were established in South Africa from 1934 to 1936. The objects

were to determine differences due to geographical races and to ascertain which stocks were most desirable for afforestation. The trials are described and data derived from an interim enumeration are analysed. Some data from a few older stands of known origin are also referred to. The investigation indicates that six races are represented in South Africa, namely, Corsican, Esterel, Landes, Luccan, Moroccan and Portuguese. The Portuguese race is proving superior to all others in rate of growth and density of timber and its use in preference to all others for afforestation in this country is confirmed. *Authors' summary.*

[763]. 12.11.3 (71) : 12.25. FARRAR, J. L. **Forest tree breeding in Canada.** Dominion Forest Service, Ottawa. 1947. pp. 17. [5th British Empire Forestry Conference, Great Britain, 1947.]

The history of organized research into forest tree breeding in Canada is briefly reviewed, and a more detailed account (citing literature) is given of the work carried out in and around Ottawa and at the Petawawa Forest Experiment Station. The Sub-committee on Forest Tree Breeding considers that the following projects are of major importance: (1) Production of White Pine of good quality and rapid growth, resistant to blister rust and weevil. (2) Production of rapid-growing, high-quality Spruce for both pulpwood and lumber. (3) Production of hardy, drought- and disease-resistant Poplars for shelterbelt planting in the western prairies. (4) Production of rapid-growing, disease-resistant, high-quality Poplars for pulpwood, match stock, and veneer. Progress reports are given on these projects. Quotation is made from unpublished reports by Heimburger on provenance tests on strains of *Picea abies* from 20 localities in Europe and 5 plantations in Canada [cf. *For. Abstr.* 7 (No. 88)]. Those from northern Norway are heterogeneous and show abnormalities in growth form, while those from Latvia are homogeneous and quite normal in growth form. In general, strains from the regions east of the Baltic have produced very satisfactory stock. Seed from certain plantations near Grand' Mère, Quebec, are superior in many respects to seed of any European origin tried so far. *P. obovata* from Latvia ranks with the better *P. abies*. *P. asperata* from planted specimens in France also shows promise. There seems to be considerable variation within strains of *P. abies*; certain plants from one Rumanian strain are outstandingly vigorous. In almost all strains some plants are attacked by *Pissodes strobi* while others near by are unaffected.

Strain tests of native species of Spruce are also in progress. Heimburger has observed that in *P. glauca* the marked differences in morphological characters found in the mature material in the Rocky Mountains have not been evident in their progeny. These strains have shown resistance to late spring frosts in spite of their early spring growth. The progeny of *P. mariana* growing in uplands are more drought-resistant and easier to transplant than the progeny of trees of the same species growing in swamps; they also differ in growth form and morphological features. This suggests the existence of ecotypes within the species. The upland ecotype is a tree with considerable promise, being resistant to spring frosts and fairly fast growing.

[764]. 12.11.3 : 12.26–8 : 12.25 (478). AL'BENSKI, A. V. Rost i zimostyokost' mezhvidovÿkh gibridov drevesnÿkh porod. **[Growth and winter-hardiness of interspecific hybrids of tree species.]** *Nauchnÿ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 172–84. [Russ.]

In extension of previous work [see *For. Abstr.* 3 (30, 202); 6 (143)] Al'benski deals with hybridization trials from 1939 onwards at Kamÿshin, Stalingrad Province, particularly with species of Poplar and Maple, and with continued observations on hybrid Larches raised and grown in Moscow Province.

(*a*) Tables are given of the height growth and number of plants with frozen shoots in crosses of—(i) *Populus alba* ♀ with *P. bolleana*, (*P. tremula* × *alba*), *P. suaveolens*, *P. canadensis*, *P. pyramidalis* and *P. tremula*; (ii) *P. tremula* ♀ with *P. alba*, *P. bolleana*, *P. suaveolens*, *P. canadensis*, *P. nigra* and *P. pyramidalis*; (iii) *P. canadensis* ♀ with *P. nigra* and *P. pyramidalis*; (iv) *P. nigra* ♀ with *P. pyramidalis*, *P. tremula*, *P. berolinensis* and *P. simonii*; and (v) *P. pyramidalis* ♀ with *P. berolinensis*, *P. wislizenii*, *P. suaveolens*, *P. canadensis*, *P. simonii* and *P. nigra*. In all, 269 combinations were made. Notes are also included on F_2 plants from open-pollinated *P. tremula* × *alba* and the growth at Kamÿshin of cuttings of *P. balsamifera* ♀ × *berolinensis* ♂ and

P. moscoviensis ♀ × *berolinensis* ♂, all from Moscow. The best hybrid Poplars so far obtained are listed with brief details of parentage and origin, morphological features and behaviour; all are said to be frost- and drought-resistant, propagable by cuttings, little affected by borers and, except *P. vernirubens*, cultivable on a wide range of soils, including chestnut earths. They are:—*P. balsamifera* ♀ × *berolinensis* ♂—reaching 4·8 m. in height and 6 cm. diameter at 4 years of age at Kamȳshin (on chestnut earths); finishing annual height growth at the end of July, and suitable for the southern forest zone, forest steppe and steppe zones of European Russia. *P. moscoviensis* ♀ × *berolinensis* ♂—5·5 m. high and 6 cm. in diameter at 4 years at Kamȳshin; height growth ending in late July; suitable for the same regions as the preceding. *P. vernirubens* (obtained from Prof. Henry's widow)—8·5 m. high and 14·5 cm. in diameter at 7 years of age on a podzol soil; height growth ending in July; suitable for rather moist soils in the same regions as the preceding. *P. pyramidalis* ♀ × *simonii* ♂ (Kamȳshin No. 657)—4·2 m. high at 4 years of age at Kamȳshin; height growth ending in early August; suitable for S.E. and E. European Russia. *P. pyramidalis* ♀ × *nigra* ♂—4·6 m. high and 5 cm. in diameter at 4 years of age [at Kamȳshin?]; height growth ending in mid-August; suitable for S.E. and S. European Russia. *P. alba* ♀ × *bolleana* ♂—4·5–4·7 m. high and 4·2 cm. in diameter at 4 years of age at Kamȳshin; height growth ending in mid-August; suitable for S.E. and S. European Russia, Caucasus and central Asia, on rather moist soils.

(*b*) Maple hybrids produced (tables are given as for the Poplars) were: (i) *A. platanoides* ♀ × *A. negundo*—two- and three-year-old hybrids from the first crossings were no taller but more frost-hardy than progeny of selfed *A. platanoides*. In the 1-year-old progeny of later crossings, one lot showed 50 per cent. better height growth than controls. (ii) *A. negundo* ♀ × *A. saccharinum* ♂ and × *A. platanoides* ♂—three-year-old hybrids of the former parentage were poorer, whereas those of the latter parentage were 34–40 per cent. better in height growth than controls.

(*c*) A final table shows the height growth of various Larch hybrids raised from crossings made in 1933–36, including (mother species quoted first in each case) *Larix sibirica* × *kaempferi* and the reciprocal, *L. sibirica* × *decidua* and the reciprocal, *L. sibirica* open-pollinated, *L. decidua* × *kaempferi*, *L. dahurica* × *kaempferi*, and the pure species *L. dahurica* and *L. decidua*. Of these the most promising appears to be *L. sibirica* × *kaempferi* (mean height at 9 years 467 cm., best 610 cm.) though progeny of the reciprocal cross were considerably inferior in mean and maximum height and in frost resistance. *L. sibirica* × *kaempferi* was also the only hybrid to show straight stems when grown in stands. It is suggested that *L. sibirica*, *L. kaempferi* and *L. decidua* should be planted together and seed collected only from the first-named.

(*d*) A special success at Kamȳshin was the production in 1942 of seed from pollinations of *Acer tataricum* with *A. negundo*, *A. platanoides* and *A. campestre*, and of *Celtis occidentalis* with *Ulmus pinnato-ramosa*. No further details are given of these crosses.

[765]. 12.11.3 : 12.26–8. Beldie, A., and Cretzoiu, P. Un hibrid nou intre *Alnus glutinosa* şi *Alnus incana*. [**A new hybrid between *Alnus glutinosa* and *A. incana*: [*A. glutinosa* × *incana* Krause ssp. *tauschiana* Call. var. *heterophylla* Beld. et Cretz. n.var.].**] *An. Inst. Cerc. Exp. for., Bucureşti* (*Ser. I*) 8, 1942 (179–81). [Rum.g.] D.S.I.R.

[766]. 12.11.3 : 12.26–8. Johnsson, H. **Interspecific hybridization within the genus *Betula*.** *Separate* of *Hereditas, Lund* 31, 1945 (163–76).

The experiments were carried out by means of bottle-grafting, which is described in some detail. Interspecific crossing experiments between *Betula verrucosa* and other species are reported. The combinations *B. verrucosa* × *B. papyrifera* and *B. verrucosa* × *B. japonica* are fertile and vigorous. Interspecific crossing experiments between *B. pubescens* and other species produced fairly fertile hybrids and the cross *B. pubescens* × *B. papyrifera* showed heterotic vigour. Species of the section *Albae* are extremely, if not completely, sterile in combinations with species of the section *Costatae*. Crosses between the two *Albae* species *B. pubescens* and *B. verrucosa* are also extremely sterile. The results obtained are discussed, special stress being laid on the lack of agreement between the extreme sterility in the cross *B. pubescens* × *B. verrucosa* and the

general conception that the numerous intermediate forms between these two species are of hybrid origin.

[767]. 12.11.3 : 12.26–8 : 34.26. BALDWIN, J. T. ***Hevea* : a first interpretation. A cytogenetic survey of a controversial genus, with a discussion of its implications to taxonomy and to rubber production.** *J. Hered.* 38 (2), 1947 (54–64). O.R.S.

[768]. 12.11.3 : 12.26–8. JOHNSSON, H. **Chromosome numbers of twin plants of *Quercus robur* and *Fagus silvatica*.** *Separate* of *Hereditas, Lund* 32, 1946 (469–72).

Chromosome number determinations have been done on a large number of twin plants of Oak and Beech at Ekebo. Twin frequency is high in these species, but frequency of triploid twin plants was found to be very low—0·41 per cent. for the Oak material (721 plants) and 0 per cent. for the Beech (102 plants).

[769]. 12.11.3 : 12.26–8. PJATNITZKY [PYATNITSKI], S. S. **Experimental production of interspecific hybrids of the genus *Quercus*.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 52 (4), 1946 (343–5). [E.] [Ukrainian Research Institute of Agriculture and Silviculture, Kharkov.] O.R.S.

During five years' work (1937–41) on interspecific hybridization in *Quercus*, 39 hybrid combinations were produced.

The hybrids of *Quercus* are of some economic interest owing to the heterosis exhibited by them, as well as to the fact that some of the hybrids of Cork Oak have proved to be fully winter-hardy, enabling them to survive under the climatic conditions of the northern part of the Ukrainian steppe where they are now cultivated.

[770]. 12.11.3 : 12.26–8. PJATNITZKY [PYATNITSKI], S. S. **New hybrid forms of Oak, *Quercus komarovii* and *Quercus timirjasevii*, produced experimentally.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 52 (7), 1946 (625–6). [E.] [Ukrainian Research Institute of Melioration and Forestry, Kharkov.] O.R.S.

[771]. 12.11.3 : 12.26–8. ATCHISON, E. **Chromosome numbers in the Myrtaceae.** *Amer. J. Bot.* 34 (3), 1947 (159–63). [Blandy Experimental Farm, Univ. of Virginia, Boyce, Va.] O.B.D.

Angophora, Eucalyptus, Tristania, Backhousia, Leptospermum and *Callistemon*, have consistently been found to have diploid chromosome numbers of twenty-two. Chief variations are found in the subfamily Myrtoideae; four genera (*Myrtus, Eugenia, Feijoa* and *Psidium*) have diploid numbers ranging from 22 to 28 to 88.

[772]. 12.11.3 : 12.26–8. FEDOROVA-SARKISSOVA, O. V. **On the chromosome number of certain Willow and Poplar species.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 54 (4), 1946 (353–6). [E.] [Kirov Silvitechnical Academy, Leningrad.] O.R.S.

[773]. 12.11.3 : 12.26–8. ALMEIDA, J. L. FERREIRA DE. Sobre a cariologia de *Salix salviifolia* Brot. e *S. babylonica* L. **[On the karyology of *Salix salviifolia* and *S. babylonica*.]** *Bol. Soc. broteriana* 20 (2.ª Ser.), 1946 (201–42 + plates). [Port.port.e.]

12.13. Embryology

[774]. 12.13 : 12.25 : 12.14. ALLEN, G. S. **Embryogeny and the development of the apical meristems of *Pseudotsuga*. III. Development of the apical meristems.** *Amer. J. Bot.* 34 (4), 1947 (204–11). [Univ. of British Columbia, Vancouver, B.C.] O.B.D.

12.14. Organography. Morphology. Anatomy. Histology

[775]. 12.14.3 : 01.6. DUNNING, D. **Roots of forest trees. A selected list of references.** *For. Res. Notes Calif. For. Range Exp. Sta.* No. 52, 1946. pp. 40.

[776]. 12.14.3 : 12.26–8. RAGONESE, A. E., and COZZO, D. Raíces gemíferas en el 'Palo Santo' (*Bulnesia sarmientoi* Lor. ex Gris.). **[Gemmiferous roots in *Bulnesia sarmientoi*.]** *Publ. téc. Direcc. for. Argent.* No. 3, 1945 (7–8). [Span.]

[777]. 12.14.9 : 12.26–8 : 31.1 : 12.14.8. CHAPMAN, V. J. **Secondary thickening and lenticels in *Avicennia nitida* Jacq.** *Proc. Linn. Soc. Lond. 1945–46* 158 (1), 1947 (2–6). O.B.D.

Secondary thickening in the stem of *Avicennia nitida* is brought about through the

development of successive extra-fascicular cambial rings. A correlation appears to exist between the number of stelar rings and the age of the plant, but the correlation is not so precise as that of temperate trees and their annual rings. The process of lenticel formation is discussed and illustrated diagrammatically.

12.19. Geographical Distribution. Plant Geography and Sociology

See also *For. Abstr.* 9 (Nos. 726, 750–1, 819–21).

[778]. 12.19. BEARD, J. S. **Ecology: forestry's fundamental science.** H.M. Forestry Commission, London. 1947. pp. 4. [5th British Empire Forestry Conference, Great Britain, 1947.]

The science of ecology is shown to be of fundamental importance as the basis for sound forest policy and land planning, forest reservation, forest management and silviculture. Examples are given of the way in which forest operations in Trinidad and the adjoining islands of the West Indies have benefited from the application of ecological principles. [Cf. *For. Abstr.* 7 (No. 718).]

12.19.2. *Forest Types*

See also *For. Abstr.* 9 (Nos. 820, 830–1, 834).

[779]. 12.19.2 (45) : 11.48.5. BAY, E. Aspetti forestali del Carso goriziano. **[Forest aspects of the Karst of Gorizia.]** *Riv. for. ital.* 2 (11/12), 1940 (30–43). [It.]

The various forest types are described in some detail; they include the *Lauretum*, *Castanetum*, *Fagetum* (which is the most extensive), *Piceetum*, and *Alpinetum*.

[780]. 12.19.2 (494). ETTER, H. Über die natürliche Waldvegetation des Kantons Thurgau. **[The natural forest vegetation of Canton Thurgau.]** *Schweiz. Z. Forstw.* 98 (7), 1947 (249–59 + plates). [G.]

Mainly a description of the climax type, *Querceto-Carpinetum*, of the lower hills.

[781]. 12.19.2 (71). LAFOND, A. La classification écologique des forêts. **[The ecological classification of forests.]** *For. québec.* 12 (6), 1947 (463–6, 469–73). [F.]

The author describes in some detail Cajander's system of forest types and the attempts that have been made to adapt it to Canadian conditions; compares it with Braun-Blanquet's phytosociological methods of classification; and finally concludes that a combination of the two methods is desirable for a natural ecological classification of Canadian forests.

[782]. 12.19.2 (71) : 23.1. MULLOY, G. A. **Forest ecology in Canada.** Dominion Forest Service, Ottawa. 1947. pp. 7. [5th British Empire Forestry Conference, Great Britain, 1947.]

Previous publications on Canadian forest types are briefly reviewed. Most work of this nature has been based on Heimburger's classification of vegetation [cf. *For. Abstr.* 3 (262)]. Much more intensive work to define types in small catchment areas, etc., is necessary before this method of designating forest types becomes practicable. A résumé is given of the results of a survey of reproduction undertaken by the Dominion Forest Service in 1946 to find out in which regions, sections and types, regeneration is satisfactory.

[783]. 12.19.2 (729.4) : 12.25. MARIE-VICTORIN, [FRÈRE]. Les hautes pinèdes d'Haiti. **[The high-level Pine stands of Haiti.]** *Contr. Inst. bot. Univ. Montréal* No. 48, 1943 (47–60). [F.]

Account of the forest of *Pinus occidentalis* which occupies the high plateaux of Morne des Commissaires in Haiti.

[784]. 12.19.2 (931). HOLLOWAY, J. T. **Forest associations of the Longwood Range, Southland.** *N.Z. J. For.* 5 (3), 1946 (199–209).

12.19.3. *Other Vegetation Types*

[785]. 12.19.3 (548.7) : 12.19.4. ROSAYRO, R. A. DE. **A new view point on the origin of montane grasslands in Ceylon.** Ceylon Govt. Press, Colombo. 1947. pp. 5. [5th British Empire Forestry Conference, Great Britain, 1947.]

The hitherto generally accepted explanation of the origin of the *patanas* (montane grasslands) of Ceylon advanced by Pearson in 1899, attributes their existence to periodically recurrent grass fires transforming a savanna-forest type into grassland. A similar explanation has been put forward recently by Holmes [see *For. Abstr.* 7 (No. 1777)] who, however,

stresses the necessity for the initial clearing of the original forest. These theories are examined in the light of the new evidence provided by ecology and prehistory. In the writer's opinion the origin of the *patanas* is more satisfactorily explained by regarding the dry *patanas* as natural grassland climaxes and the wet *patanas* as edaphically conditioned preclimaxes which have been expanded by fire.

[786]. 12.19.3 (794). 21.8 : 11. MILLER, E. H., JR. **Growth and environmental conditions in southern California chaparral.** *Amer. Midl. Nat.* 37 (2), 1947 (379–420).

Observations in the chaparral of the San Gabriel Mts. were made at elevations from 1,500 to 5,500 ft. at roughly 1,000-ft. intervals.

Because the climatic conditions throughout the area vary but little, it is concluded that the types of vegetation are produced by relatively small climatic differences. It seems probable that the amount of available soil moisture is the most important factor in producing the differences in vegetative cover.

Minimum air temperatures appear to be the controlling factor in determining the inception of growth in spring. The effect of altitude in retarding growth is apparently due to temperature reduction. Growth in species found on both north and south slopes began first on north slopes in most cases, even when temperatures were lower. It is suggested that the greater air temperature range, evaporation rates, or insolation on southerly slopes exerted a retarding effect on the inception of growth.

Environmental conditions at the end of the growing season differed only slightly from those at its inception. The cessation of growth was not caused by the reduction of soil moisture below the wilting point in most cases. It appears to be caused by factors which produce higher evaporation rates. *From author's summary.*

[787]. 12.19.3 (85). KNUCHEL, H., JR. Über die Nebelvegetation an der peruanischen Küste. **[On the fog vegetation of the Peruvian coast.]** *Schweiz. Z. Forstw.* 98 (2), 1947 (81–4). [G.]

A note on the *lomas* of the coastal desert, which are more thickly vegetated areas having a growing season corresponding to the May–November coastal fog period when fog can be almost continuous in certain areas. The *lomas* occur on hills behind the coast between about 200 and 100 m. elevation; their vegetation consists largely of annual herbs, but shrubs occur sporadically (chiefly at the higher altitudes) and in a few especially favourable places, trees of *Salix humboldtiana* and *Acacia macracantha* grow singly or in small groups. It is difficult to judge whether the *lomas* may ever be of any importance for forestry, but it is possible that the small tree groups might be extended by afforestation and so develop gradually into true woodland, possibly with some improvement in local climate. [Cf. *For. Abstr.* 6 (72).]

12.19.4. *Succession*

[788]. 12.19.4 (44) : 96.3. DUGELAY. Les données particulières de l'économie forestière méditerranéenne. **[Data peculiar to the forest economy of the Mediterranean region.]** *Bois For. Trop.* 1 (1), 1947 (37–80). [F.]

An exposition of the state of disequilibrium in the Mediterranean region of France, where the climax forest of Evergreen Oaks, managed as coppice on too short rotations, gradually gives way to *Pinus pinaster*, which in turn disappears, leaving a useless *garigue*. The necessity of close co-operation between forest and pastoral interests is urged.

12.2. *Special (Systematic) Botany*

[789]. 12.2 : 01.2. CAMP, W. H., RICKETT, H. W., and WEATHERBY, C. A. [Compilers]. **International rules of botanical nomenclature.** Published by the New York Botanical Garden in co-operation with the American Society of Plant Taxonomists. Lancaster, Pa. 1947. pp. 120. *Repr.* from *Brittonia* 6 (1), 1947 (1–120). Price 42*s.*

12.21. Fungi

See *For. Abstr.* 9 (No. 727).

12.23. Bryophyta

[790]. 12.23 (410) : 12.19.3 : 11.44. WATSON, H. **Woodland mosses.** *Bookl. For. Comm., Lond.* No. 1, 1947. pp. 48. [Benmore Forest School, Argyll.]

Notes on 20 of the commoner British woodland mosses with indications of the climatic

and edaphic conditions in which they are found and in each case a photograph of the individual shoot and also of the moss in its natural position on the ground.

12.25. Gymnosperms

See also *For. Abstr.* 9 (No. 808).

[791]. 12.25 (95). WHITE, C. T. **Notes on two species of *Araucaria* in New Guinea and a proposed new section of the genus.** *J. Arnold Arbor.* 28 (2), 1947 (259–60). [Botanic Museum and Herbarium, Brisbane, Australia.]

12.26-8. Dicotyledons

See also *For. Abstr.* 9 (No. 810, 813, 895, 901).

[792]. 12.26–8 (944). BEUZEVILLE, W. A. W. DE, and WHITE, C. T. **A new species of *Longetia* [*L. swainii*] : the botanical identity of the 'Pink Cherry' of Dorrigo timber-getters.** *Proc. Linn. Soc. N.S.W.* 71 (Pts. 3/4, No. 325/6), 1947 (236–8). P.R.

[793]. 12.26–8 (498). GEORGESCU, C. C., and CRETZOIU, P. Considerațiuni sistematice asupra speciei *Quercus pedunculiflora* K. Koch în România. [**Systematic observations on *Q. pedunculiflora* in Rumania**]. *An. Inst. Cerc. Exp. for., București* (*Ser. I*) 7, (1941) 1942 (3–37 + plates). [Rum.g.] P.R.

[794]. 12.26–8 (498). BELDIE, A., and CRETZOIU, P. Studiul sistematic al gorunului din România. [**Systematic study of the Sessile Oaks [*Quercus sessiliflora*] of Rumania.**] *An. Inst. Cerc. Exp. for., București* (*Ser. I*) 7, (1941) 1942 (38–49 + plates). [Rum.g.] P.R.

[795]. 12.26–8 (498). GEORGESCU, C. C., and MORARIU, I. Studiul sistematic al speciilor de *Quercus* din România. V. *Quercus cerris* L. [**Systematic study of species of *Quercus* in Rumania. V. *Quercus cerris* L.**] *An. Inst. Cerc. Exp. for., București* (*Ser. I–a*) 9 (1), (1943) 1945 (135–46). [Rum.f.] P.R.

[796]. 12.26–8 : 31.0. CHEVALIER, A. Sur diverses Légumineuses Caesalpiniées à feuilles multi et parvifoliolées vivant dans les forêts de l'Afrique tropicale et donnant des bois recherchés. [**On some multi- and parvifoliolate Leguminosae-Caesalpinioideae growing in the forests of tropical Africa and yielding valuable timer.**] *Rev. int. Bot. appl. Agric. trop.* 26 (289/290), 1946 (585–621). [F.] P.R.

Includes the following new genera: *Microberlinia* (2 spp.), *Dipetalanthus* (2 spp.), *Tripetalanthus* (2 spp.), *Zingania* (1 sp.), and new species of *Monopetalanthus* (3), *Cynometra* (2).

[797]. 12.26–8 (672). NORMAND, D. Note sur le Zingana (*Microberlinia brazzavillensis* A. Chev.). [**Note on *Microberlinia brazzavillensis.***] *Agron. trop.* 1 (9/10), 1946 (516–7). [F.]

[798]. 12.26–8. CHEVALIER, A. Sur l'identification d'un Bois de rose du Gabon ou Bubinga. [**On the identification of a Gabon Rosewood or Bubinga [*Monopetalanthus* spp.].**] *C.R. Acad. Sci., Paris* 222 (22), 1946 (1267–8). [F.] D.S.I.R.

[799]. 12.26–8 (671). JACQUES-FÉLIX, H. Le Karité (*Butyrospermum parkii*) au Cameroun. [***Butyrospermum parkii* in the Cameroons.**] *Rev. int. Bot. appl. Agric. trop.* 26 (283/284), 1946 (217–21). [F.] P.R.

Geographical distribution, density of stocking, and economic importance.

[800]. 12.26–8. CHEVALIER, A. La famille des *Huacaceae* et ses affinités. [**The family *Huacaceae* and its affinities.**] *Rev. int. Bot. appl. Agric. trop.* 27 (291/292), 1947 (26–9). [F.] P.R.

13. FOREST ZOOLOGY

13.1. *General Zoology*

See also *For. Abstr.* 9 (No. 730).

[801]. 13.15 : 45. DEBACH, P., and SMITH, H. S. **Effects of parasite population density on rate of change of host and parasite populations.** *Ecology* 28 (3), 1947 (290–8). [University of California Citrus Experiment Station, Riverside, Calif.]

The effect of parasite population density is analysed, and it is shown that increases in host density act to increase numbers of parasites in the next generation, although not in direct proportion to host density, whereas increases in parasite density, beyond a certain point in relation to host density, result in a decrease in the total numbers of parasites in the next generation. When the two factors, host population density and parasite population

density, are considered together, it is apparent that their relative numerical relations alone are sufficient to explain population oscillations about an equilibrium position obtained over successive generations. *From authors' summary.*

[802]. 13.15 : 13.2. WILKES, A. **The effects of selective breeding on the laboratory propagation of insect parasites.** *Proc. roy. Soc., Lond.* (*Ser. B*) 134 (875), 1947 (227–45). [Dominion Parasite Laboratory, Belleville, Ont.] O.B.D.

The formal application of certain animal breeding methods has been investigated on the laboratory propagation of *Microplectron fuscipennis*, a parasite of the Spruce sawfly (*Gilpinia hercyniae*). Selection in the breeding lines brought about a continuous decrease in the number of sterile males from 35 to 2 per cent., an increase in the mean number of offspring per mother from 34 to 68 and an almost equal reduction in variability of development, oviposition and length of adult life. Tests are reported on the effects of inbreeding and outbreeding on these lines using wild and laboratory-reared stock. *From author's abstract.*

[803]. 13.15 : 13.2 : 11.1. WELLINGTON, W. G., and CAMERON, J. M. **Investigations on meteorological and other physical factors.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 3 (2), 1947 (2).

In order to study the effect of meteorological factors on the activity, dispersal, and survival of the Spruce budworm and other forest insects, two record stations have been established at Pointe aux Pins near Sault Ste. Marie and at Black Sturgeon Lake, Ont. One of the most important objectives of the observations at Pointe aux Pins will be to correlate variations in ecoclimates with variations in general weather as recorded by standard screened instruments. Correlations with biological phenomena will be made possible by means of insect behaviour records obtained from a trapping device designed to register flights of adult insects over measured periods of time. At the Black Sturgeon Lake field station, in addition to meteorological records, studies will be made of insect activity such as local migrations and aerial dispersal. Laboratory experiments in the current season will be concerned with (1) measurements of the minimum velocities of air currents necessary to support second-stage Spruce budworm larvae and adults; (2) the maximum lethal temperatures for larvae and adults of the Spruce budworm; (3) the effects of variable temperature and evaporation on the activities of the larvae and adults; (4) the orientations of the adults to light.

Previous experiments in the laboratory, supplemented by observations in the field, led to the following conclusions: (1) that larvae become sluggish or immobilized at low rates of evaporation in the temperature range of 50° to 100° F.; (2) that larvae react positively to sources of diffuse light regardless of the degree of starvation, but if sufficiently starved will react negatively to a point source of light such as the disc of the sun; (3) at high temperatures, even fully fed larvae become negative to either diffuse or directed light.

13.2. *Special (Systematic) Zoology*

[804]. 13.2 (71) : 02.41. Liste officielle des noms français des insectes d'importance économique au Canada. **[Official list of French names of insects of economic importance in Canada.]** Ministry of Agriculture, Quebec. 1947. pp. 66. [In collaboration with the Quebec Society for the Protection of Plants.]

Gives scientific, Canadian-French, and English names.

2. SILVICULTURE

[805]. 2 (410) : 6. **Report on British forestry by the committee on forest management.** In *Fifth British Empire Forestry Conference, Great Britain, 1947: Summary Report.* 1947 (44–5). H.M. Stationery Office, London.

[806]. 2 (595). STRUGNELL, E. J. **Developments in silvicultural practice in Malayan evergreen forests.** Malayan Union Govt. Press, Kuala Lumpur. 1947. pp. 5. [5th British Empire Forestry Conference, Great Britain, 1947.]

Malayan silviculture is in a state of transition due to the large variety of species taken by the recently developed sawmill industry and the results of experience of regeneration work.

In the 'soft wood' forest (largely composed of *Shorea* spp.) it has been found that the former expensive practice of securing regeneration by a series of seeding fellings, cleanings and girdlings, is unnecessary and even harmful, for, while young regeneration 5–10 ft. high can recover from heavy overwood fellings in a couple of years, growing as strongly as ever from stool shoots, regeneration above 12 ft. high suffers severely from felling damage. Research plots have also shown that repeated cleanings to get rid of creepers are unnecessary; the climber stage is transitory and is now left to work itself out. Other research plots showed that the regeneration was fully capable of looking after itself in competition with secondary growth, provided that no heavy-crowned trees were left over from the mature crop to suppress it. Thinnings have also been found to be unnecessary, though not precluded in areas where they are saleable.

In the 'hard wood' (*Shorea maxwelliana*, *Balanocarpus heimii*, *Intsia palembanica*, etc.) forest the above modifications apply only with certain important exceptions. The most important of these arises from the fact that the regeneration generally will not keep pace with the secondary growth, and yet is intolerant of shade. Experiments are in progress, but it may prove more economical to accept the lengthening of the rotation due to slow growth in the early stages rather than attempt to force the pace by repeated cleanings.

Destruction of forest for food growing during the Japanese occupation will entail planting on a larger scale than has been practised hitherto. *Fragraea fragrans* is the most suitable species for planting *lalang* (*Imperata* sp.) areas, as it is fire-resistant, grows well in *lalang*, and gives a useful pole for the mining market. On other areas, high-forest species can be used. Difficulties of seed supply restrict the use of Dipterocarps and it is intended to use a large proportion of *Intsia palembanica*.

[807]. 2 (97) : 6 : 4. **Report of the committee on forest management, silviculture and protection.** In *Fifth British Empire Forestry Conference, Great Britain, 1947: Summary Report.* 1947 (39–43). H.M. Stationery Office, London.

The report of this committee, which was approved by the Conference, includes the following recommendations:—(1) Working plans at the earliest possible date for all forests and areas allocated to use as forest; all such plans as are of major importance to be sanctioned by the highest competent authority, with adequate safeguards against unnecessary deviations. (2) Adequate funds to be assured to Forestry Departments for a period of not less than 10 years at a time. (3) Adequate records of the history of forest management units. It is recommended that the Imperial Forestry Institute be asked to collect and publish experience with the maintenance of such records. (4) Increased attention to silvicultural research, particularly in the regeneration of indigenous forests and the establishment technique and general silviculture of the species used in afforestation work. (5) Attention to the effect of silvicultural treatment upon timber quality, with special reference to the influence of the extreme range of growing space upon the incidence and quality of increment. (6) More attention to soil, ecological and nutritional studies, pruning problems and the mechanization of planting and other operations. (7) Fully exploring the potentialities of the application of genetics to forestry. (8) Further research in fire control methods and appliances and the necessity for adequate fire control legislation. (9) The appointment of competent investigators to study forest insects and disease in anticipation of possible outbreaks. (10) The development of improved methods for the 'shifting cultivation' practised in some countries and the introduction of legislation to control it; the limitation of the incidence of grazing to that which the land can safely bear.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

See also *For. Abstr.* 9 (Nos. 895, 901).

[808]. 21 : 12.25 (45) : 12.19 : 3 : 47. GIORDANO, G. Il pino uncinato nelle Alpi Piemontesi. **[The Mountain Pine in the Piedmontese Alps.]** *Riv. for. ital.* 2 (7), 1940 (13–26). [It.]

Deals with botanical characters, taxonomy, distribution, ecology, exploitation, volume tables, management, characters and uses of wood, injuries and diseases, and regeneration of *Pinus mugo* var. *rostrata* (= *P. uncinata* = *P. montana* var. *uncinata*) in the Piedmontese Alps. [Cf. *For. Abstr.* 9 (No. 1343).]

[809]. 21 : 12.26–8 (548) : 23 : 24. RAGHAVAN, M. S. **Casuarina plantation technique in the Madras province.** *Indian For.* 73 (6), 1947 (241–60). [7th All-India Silvicultural Conference, Dehra Dun.]

The subjects dealt with include climatic and soil requirements, seed collection and treatment, the necessity of artificial regeneration. Planting is done either on barren, sandy coastal areas, or on sites prepared by clear-felling and burning and the raising of agricultural crops for several seasons. Notes are given on nursery technique. In general, the planting of entire, nursery-raised, 6-month-old transplants, about 2 ft. in height, at an espacement of 7 × 7 ft. in prepared 1 × 1 × 1 ft. pits, in June or July at the beginning of the south-west monsoon, followed by adequate watering on non-rainy days for a period of 1–3 years (except under the dry technique of Mysore) on a rotation of 7–10 years, is recommended. Tending operations are described. Thinning is unnecessary in fuel plantations on a short rotation with initial espacement of 7 × 7 ft. Some short notes are added on animal and insect pests and fungus diseases. *From author's summary.*

[810]. 21 : 12.26–8. STEHLÉ, H., and STEHLÉ, E. M. Le 'Magnolia', *Talauma dodecapetala* des Petites Antilles: monographie sylvo-botanique. **[The 'Magnolia', *Talauma dodecapetala*, of the Lesser Antilles: a silvicultural and botanical monograph.]** *Carib. For.* 8 (3), 1947 (183–201). [F.E.Span.]

[811]. 21 : 12.26–8 (881) : 31.0. FANSHAWE, D. B. **Studies of the trees of British Guiana. I. Crabwood (*Carapa guianensis*).** *Trop. Woods* No. 90, 1947 (30–40).

The first of a series of studies of the most important timber trees of the Colony, drawing mainly on departmental records, but also making use of other unpublished data collected by the British Guiana Forest Department over a number of years. Information given includes vernacular names, general description of the tree, habitat and frequency, stocking, and distribution; seed dispersal, survival, and germination; growth of seedlings, nursery and plantation practice, silvicultural characteristics; pests; minor forest products, wood structure, properties and uses of the timber and exploitation.

[812]. 21 : 12.26–8 (729.7). WADSWORTH, F. H. **The development of *Swietenia mahagoni* Jacq. on St. Croix.** *Carib. For.* 8 (2), 1947 (161–4). [E.Span.f.] [Tropical Forest Experiment Station, Puerto Rico.]

Swietenia mahagoni was probably introduced into the island of St. Croix (Lesser Antilles) more than a century ago. The author examined a forest of Mahogany, chiefly the result of natural reproduction following the early planting of a few trees, and concludes that this species can adapt itself to drought and poor soil, may be satisfactorily established by direct sowing, and, with close spacing, will produce straight trees of good form. In spite of slow growth (average number of rings per inch of radial growth was found to be 15·5), this is evidently one of the best species for forest lands in the dry regions of the Caribbean.

[813]. 21 : 12.26–8 (44) : 31.0. MEUNIER, G. Les peupliers français. **[French Poplars.]** *Les techniques du bois* No. 4, 1947. pp. 35 + figs. + maps + plates. [F.]

A well illustrated monograph with chapters dealing with the following subjects: classification, identification, description of some widely cultivated species, distribution of Poplars in France, choice of species for industrial utilization, silviculture, policy for Poplar growing in France.

21.0. *Adaptability to the General Environment. Acclimatization*

[814]. 21.0 (45) : 12.25. GIACOBBE, A. È conveniente la cultura della Douglasia Verde (*Pseudotsuga douglasii* Carr. var. *viridis*) in Italia? **[Is the cultivation of Green Douglas practicable in Italy?]** *Riv. for. ital.* 4 (4), 1942 (9–25). [It.]

The data so far available from experimental plantings are presented and discussed. It is concluded that, though Green Douglas will apparently grow fairly well on exceptionally good soils and sheltered sites, its performance on average sites, its liability to damage from climatic agencies and disease, and the defects in the timber produced will preclude it from general cultivation in Italy.

[815]. 21.0 (54) : 12.25 : 23.23.19 : 23.26.3. LAHIRI, K. L. **A note on *Araucaria cunninghamii*, Ait. (Hoop Pine).** *Indian For.* 73 (5), 1947 (211–4 + plate).

A general account of the species is followed by some notes on germination tests. Germination per cent. varies between 20 and 50. Seedlings need careful handling in transplanting, and for this purpose the bamboo tube method has proved successful [cf. *For. Abstr.* 9 (No. 851)]. Experiments have been made in growing Hoop Pine in India. At New Forest, the 1931 plantations had in 1945 an average height of 32 ft. and average d.b.h. of 4·9 in. In Madras transplants attained a mean height of 5·5 ft. in 4 years. In the hills of Darjeeling an average height of 11 ft. and a maximum height of 19 ft. 6 in. was attained by a 9-year-old plantation.

[816]. 21.0 (68) : 12.25 : 56 : 23.24.3 : 24.2 : 24.51 : 76. CRAIB, I. J. **The silviculture of exotic conifers in South Africa.** [Department of Forestry, Pretoria.] 1947. pp. 35. [5th British Empire Forestry Conference, Great Britain, 1947.]

A brief outline of the background in current silvicultural policy in South Africa is given. Methods of afforestation are discussed and recommendations for the amendment, where necessary, of present practice regarding initial espacement and pruning are made. Data on the effects of growing-space upon natural competition, increment and ring width [cf. *For. Abstr.* 9 (No. 920)] are presented. These show that under South African conditions suppression of the predominants commences at an early age for a wide range of tree densities and the time of its onset is not markedly affected by site or species; also that, despite this suppression, ring widths are apt to be large in the predominants during youth, irrespective of tree density. The data show, moreover, that maximum monetary returns from early thinnings are likely to be derived from initial espacements of 9 × 9 to 12 × 12 ft.

Data are given which show that the longer thinning to a given density of growing stock is delayed, the greater will be the loss in total volume increment thereafter. Upon the basis of the increments of unthinned stands growing at various densities, extrapolated to maturity, it is shown that the financial returns from relatively heavily thinned stands are likely to be far greater (almost double) those of relatively lightly thinned stands.

Reference is made to the remarkable vigour of the Portuguese strain of *Pinus pinaster* [cf. *For. Abstr.* 9 (No. 762)] relative to other strains, and to the reasons why *P. pinaster* should, in future, receive the same silvicultural treatment as other medium-fast-growing Pines like *P. taeda* and *P. caribaea*. The paper concludes with a summary of recommendations made to amend those proposed by the writer in 1939. [Cf. *For. Abstr.* 1 (165).]

[817]. 21.0 (931) : 96.5. FOSTER, F. W. **Exotic forests of New Zealand** State Forest Service, Wellington, N.Z. 1947. pp. 17. [5th British Empire Forestry Conference, Great Britain, 1947.]

Of the 860,000 acres of recorded exotic forest area in New Zealand, nearly 80 per cent. was planted under 'boom' conditions extending over a period of only about a dozen years, or at a mean annual rate of some 50,000 acres. Owing to owners' demands for speedy planting, technique was over-standardized, costs were cut to the bone, silvicultural practices were faulty or definitely bad, and the resultant stands are now very variable in quality and their age classes very unevenly distributed. The exotic forest areas are classified under ownership, species, and other headings, and the forest policies of the various owners described. The principal silvicultural defects were inferior seed supplies and nursery stock, adopting notch planting as a universal practice, direct drill-sowing by machine, direct spot-sowing, ignoring site requirements of species, planting infertile land, planting in dry spring weather, failing to fill blanks when necessary, neglecting release cuttings. All these factors have led to unstocked and sparsely stocked stands. A contributory factor was the employment of too many inexperienced and seasonal workers. Low initial density affects nearly 90 per cent. of these forests. Before 1923, State forests were planted at heavy initial densities, but between 1923 and 1936 all species were planted at 680 to the acre. From 1937 onwards the minimum density has been 1210, which yields excellent pulpwood at 11 years. Other weaknesses are bad age-class distribution (75 per cent. of *Pinus radiata* and 65 per cent. of other species are in the 11–20 year age class); unbalanced proportion of tree species (*P. radiata* forms 63 per cent. of all exotic forests); faulty location of forests in relation to markets; unsatisfactory timber sales policies; and wasteful utilization.

[818]. 21.0 (931) : 12.25 : 23.1. FORBES, A. C. **Natural regeneration of Monkey Puzzle (*Araucaria imbricata*) in N.Z.** *N.Z. J. For.* 5 (3), 1946 (232–3).

A report of the production of viable seed by *Araucaria imbricata* in the Tapanui district of New Zealand.

21.1. *Light and Temperature Requirements*

See *For. Abstr.* 9 (Nos. 753, 825).

21.2. *Moisture Requirements*

See also *For. Abstr.* 9 (Nos. 750–2, 855).

[819]. 21.2 : 12.26–8 (498). PASCOVSCHI, S. Asupra cerințelor staționale ale câtorva plante lemnoase in raport cu condițiunile climaterice generale. [**On the site requirements of some woody plants in relation to the general climatic conditions.**] *An. Inst. Cerc. Exp. for. București (Ser. I)* 8, 1942 (87–99). [Rum.g.] D.S.I.R.

Two groups of woody species are considered:—(1) Those which in dry and warm regions seek damp sites and in moist regions dry ones, e.g. *Corylus avellana, Populus tremula, Viburnum lantana.* (2) Those which grow generally in damp sites but can also flourish in dry ones, e.g. *Rhamnus frangula, Viburnum opulus, Alnus glutinosa, Salix alba.*

21.3. *Soil Requirements*

See also *For. Abstr.* 9 (Nos. 731, 746, 749, 1323).

[820]. 21.3 : 12.25 : 21.2 : 12.19 (795). [**Soil factors influencing distribution of Ponderosa and Lodgepole Pine on the Central Oregon plateau.**] *Rep. Pacif. Nthwest. For. Range Exp. Sta. 1946*, 1947 (22).

Results of an initial study indicate that the three types, pure Ponderosa Pine, mixed Ponderosa/Lodgepole Pine, and pure Lodgepole Pine, occur on three different soil structures; the first thrives on sloping, well drained soil underlain by basaltic rock, the second on a level, medium-drained soil, the third on areas of slight depression where water tends to concentrate, and on the colder, upper levels. The inference is drawn that the moisture tolerances of the two species, as well as their fire history, condition their occurrence.

[821]. 21.31 : 12.26–8 (498) : 12.19. CHIRIȚĂ, C. D. Stațiuni limită pentru gorun, determinate de factorul sol. [**Limits of habitat of Sessile Oak determined by the soil.**] *An. Inst. Cerc. Exp. for., București (Ser. I)* 8, 1942 (150–7). [Rum.g.] D.S.I.R.

Quercus sessilis [= *sessiliflora*] in upland districts of Rumania can form pure stands on an upper soil horizon with a clay fraction of about 35 per cent. (less than 0·002 mm. particle size), but on an upper soil horizon with a clay fraction of about 50 per cent. it gives place to *Q. cerris* or mixed stands of *Q. cerris* and *Q. conferta.*

[822]. 21.32 : 12.26–8. ZHEMCHUZHNIKOV, E. A. **Effect of water from Lake Balkhash produced upon plants in water cultures.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 51 (6), 1946 (471–4). [E.] [The A. M. Gorky Pedagogical Institute, Omsk.] O.R.S.

The inhibited growth of *Acer negundo* and *Elaeagnus angustifolia* in water of Lake Balkhash, which contains NaCl, Glauber's salt and significant quantities of magnesium compounds, including magnesium carbonate, depends not only on the sodium compounds but on the presence or absence of magnesium compounds.

[823]. 21.32 : 12.26–8 : 11.49.2 : 12.11.12. KRUPENIKOV, I. A. **Salt resistance of Aspen under natural conditions.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 49 (5), 1945 (377–80). [E.] [Naurzum State Reserve, Kazakhstan.] O.R.S.

Aspen (*Populus tremula* L.) growing in insular woods in northwestern Kazakhstan, where a strong progressive salinification of the upper horizon of the soil is taking place, has formed a salt-adapted edaphic ecotype which differs from the common Aspen in some important ecological and biochemical characters. The 'saline' Aspen is dwarfed as compared with the common form, and its leaves are thicker, more succulent and of a deeper green. Its principal biochemical characteristics are a very high total content of water-soluble materials (13·46 per cent.) in the leaves, a rather high alkalinity index, and a particularly high accumulation of water-soluble organic matter (7·23 per cent.). The high osmotic pressure of the cell sap is brought about mainly by the accumulation of water-soluble organic materials, and, to a lesser degree, of readily soluble mineral salts.

21.6. *Behaviour in the Stand. Growth Form. Habit*

See also *For. Abstr.* 9 (No. 1337).

[824]. 21.61 : 12.25 : 31.22.3 : 12.11.23. BIFOSS, C. G. **The water conducting capacity and growth habits of *Juniperus horizontalis* Moench and *Juniperus virginiana* L.** *Ecology* 28 (3), 1947 (281–9).

A series of tests on the water conductivity and measurements of the tracheids of stems of *Juniperus horizontalis* and *J. virginiana* yielded the following facts: (1) No significant difference exists between the specific conductivity of these two species when taken from approximately the same habitat. Therefore, the creeping habit of *J. horizontalis* apparently has no direct relation to the specific water-conductivity of its stem. (2) The values for specific water-conductivity of both species are definitely low, and accordingly the dimensions of the tracheids and their lumen areas as seen in transverse view are also small. The deviations are negligibly small and compensatingly distributed. (3) The growth rate, as determined from transverse sections, varies in the two species. In seasons of severe drought it is apparently quite similar in both species, while under more favourable conditions *J. virginiana* grows much faster. *Author's summary.*

21.8. *Phenology*

See also *For. Abstr.* 9 (Nos. 753–4, 786, 839).

[825]. 21.8 : 21.11 : 23.27. EISELIN. Luce artificiale e sfrondamento. [**Artificial light and leaf fall.**] *Schweiz. Z. Forstw.* 98 (4), 1947 (176). [It.]

It has been noted that Plane trees, Poplars and Willows growing in the immediate neighbourhood of electric street lamps still retain their leaves in January, while others at a slightly greater distance drop theirs in November. There is also some tendency for the branches to grow and develop in the direction of the electric light.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.1. *High Forest Forms*

[826]. 21.1 (669). ROSEVEAR, D. R. **Practical silviculture in the rain forests of Nigeria.** Forest Department, Nigeria. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

The high forests of Nigeria were almost entirely covered by concessions granting rights to selective felling under an arbitrary girth limit over large areas. Before any effective silvicultural system could be introduced, it was necessary to apply a strict felling control by area, with declaration at least five years in advance, by the firms, of their annual felling coupes. The natural system employed is based on Malayan regeneration fellings and locally known as the tropical shelterwood system. It implies a gradual opening of the valueless middle storey by poisoning, to give sufficient light for the growth of seedlings, without its being sufficient to encourage a blanketing creeper growth, during five or more years previous to commercial felling. The other high forest system employed is a modification of taungya with the object of producing a forest of natural structure rather than a pure plantation. *Author's summary.*

[827]. 22.14 : 12.25 (431–5) : 22.16 : 12.19.4 : 57.0. WECK. Die Kiefer Ostelbiens und das Plenterprinzip. [**The Pine and the selection system east of the Elbe.**] With résumé and comments by Eric Badoux. *Schweiz. Z. Forstw.* 98 (5; 6), 1947 (190–213; 228–39). [G.f.]

The author sets himself to re-examine the much debated question whether Pine can maintain itself as a dominant in mixed uneven-aged stands in Northern Germany. Attempts to regenerate Pine under Pine since 1920 have all failed, but it is firmly established that up to about 1820 thousands of acres of northern German Pine forest presented all the appearance of a selection forest. The writer explains this apparent contradiction by the conception of evolution of stands. One-, two- or many-storeyed forest may appear at different stages of forest evolution of which he describes four in detail: (1) *Pioneer woodland* (*Vorwald*) characterized by rapid growth in youth, early maturity, and low final volume; (2) *Transitional forest* (*Zwischenwald*) usually in more than one storey, where the dominant storey, the product of the previous stage, preserves its characteristics, while the growth of the components is slower at first, but is more sustained and culminates relatively late; (3) *Established forest* (*Hauptwald*) where the regeneration from the

transitional forest arrives at maturity and production is maintained for a long while at a high level; (4) *Closed forest* (*Schlusswald*) in which the crowns of all ages combine in a dense canopy which prevents all regeneration. This final stage frequently occurs in virgin forest and in selection forest treated in too conservative a manner. Thus, the same measures will have different results when carried out on stands of similar structure according as the stand is of pioneer, transitional, established, or closed type. These statements are illustrated by examples from the virgin forests of Bialowiesch, Oster-oder Heide, Tucheler Heide and Eberswalde. It is concluded that permanent selection forest of Pine can exist in North Germany, but only as a result of incessant silvicultural treatment. Regeneration of Pine in selection forest is continuous and takes place by single trees or small groups. The evolution of the soil, which proceeds *pari passu* with that of stand structure, indicates a rise in site quality which may lead to Pine being superseded in the final stages by Beech, Hornbeam or Spruce. The transition from a clear-felling system to selection management cannot be effected suddenly, but must follow the stages of natural evolution. The urgent need is for research into the silvicultural methods necessary to this end.

[828]. 22.14.2 : 12.25 (795) : 23.1 : 46 : 44.3 : 32.7. **Douglas-Fir silviculture and regeneration.** *Rep. Pacif. Nthwest. For. Range Exp. Sta. 1946*, 1947 (18–19).

Attempts have been made for the past 10 years to effect an orderly transition from mature, virgin Douglas Fir forest to rapidly-growing, managed forest, by selective cutting. Analysis of results from 72 acres of permanent sample plots on 10 typical areas of such cutting, showed that annual net loss had averaged 1,467 bd. ft. per acre during the 5 years since cutting. This does not include loss from decay in the residual stand following logging injury. A further study showed that one-third of the residual stand may be seriously scarred during selective logging of not more than 30 per cent. of the stand. Spruce, Hemlock and Balsam Firs thus injured were found to lose sound wood by decay at a rate of 1 per cent. of volume per annum on typical areas, with little surface indication of deterioration.

[829]. 22.14.2 : 32.1. JOHNSON, R. S. **Tree-marking for selection cutting.** *For. Chron.* 23 (2), 1947 (154–63).

Details of methods, cost, and results of marking mixed Spruce/Balsam/Hemlock pulpwood stands in Nova Scotia, in which all the Balsam was to be cut, and defective, wolf and crop trees of other softwood species up to 40 per cent. of the total merchantable volume. The total cost of marking, sampling and supervision of some 2,000 acres (25,000 cords) came to $0·118 per cord.

22.2. *Coppice Forest. Pollarding and Lopping Systems*

See *For. Abstr.* 9 (Nos. 1346, 1364).

22.8. *Silvicultural Description of Forms of Stand*

[830]. 22.88.1 (497) : 12.26–8 : 57 : 22.83.2. FRÖHLICH, J. Über Vorkommen, Zusammensetzung und Aufbau der südosteuropäischen Laubmisch-Urwälder. **[The occurrence, composition and structure of the mixed deciduous virgin forests of south-eastern Europe.]** *Schweiz. Z. Forstw.* 98 (4), 1947 (165–9). [G.f.]

The deciduous virgin forests of south-eastern Europe were still extensive at the beginning of the present century, but have been much reduced by over-exploitation. In hilly regions and up to an altitude of 800 m. Beech and Hornbeam are dominant, with Pedunculate Oak as a co-dominant at lower elevations. In the lowlands of Slavonia and Wallachia, Pedunculate Oak is dominant in mixture with Ash, Elm, Hornbeam, Lime and Poplars. Beech is the only species forming pure stands, some of which still survive in the eastern and southern Carpathians, Rumania and Bosnia. These forests are characterized by a high yield of sawtimber; advance growth is found only in gaps caused by mortality of old trees or by windthrow. All age and diameter classes are present. Figures are given from a one-hectare sample plot of Beech in the south-eastern Carpathians, growing on sandstone at an elevation of 500 m.; number of stems was 287, volume 583·44 cu.m., and mean tree volume 2·03 cu.m.

[831]. 22.88.1 (497 : 436) : 23.1 : 57. FRÖHLICH, J. Les enseignements de la forêt vierge. **[The lessons of virgin forest.]**

Schweiz. Z. Forstw. 98 (8/9), 1947 (318–23). [F.]

Notes on the composition, regeneration and yield of the virgin forests of the Carpathians and Dinaric Alps. At altitudes between 600 and 1,300 m., mixed stands are general, with Silver Fir and Beech as dominants in association with Spruce. A table is given showing distribution of species by diameter classes and volume in a typical mixed stand in the Salzkammergut with 224 stems and a total volume of 565 cu.m. to the hectare. Percentages of number of stems and volume respectively were Spruce 11 and 10, Fir 34 and 38, Beech 52 and 49, other species 3 and 3. Fir and Beech both attain very large dimensions and it is clear that their mixture provides optimum conditions for both species and for maintaining soil fertility.

Studies made at the seed-extraction station at Pribinic (Bosnia) showed that the oldest trees, whose crowns are entirely in the light, produce the most seed. Seed of Pines 300–400 years old had a germination rate of 94–96 per cent. Regeneration in the virgin forest takes place in gaps caused by natural mortality and/or windthrow. In mixed Beech/Fir stands it usually establishes itself in 10–30 years; in the subalpine Spruce stands, several decades often pass before regeneration takes place in gaps. The process can be accelerated by adequate soil preparation, and the activities of wild pig are of importance in this respect.

Maximum yield is found in the coniferous stands, particularly in mixtures of Fir and Spruce. While the volume per ha. in mixed Beech stands never exceeds 500–700 cu.m., there are coniferous stands in Bosnia and Asia Minor with volumes of 800–900 cu.m., and one stand of Spruce and Pine yielded as much as 1,140 cu.m. In virgin forest the highest-quality timber is always found in the comparatively small pure stands, as well of Beech as of conifers. In spite of this superiority, however, pure stands should not be established outside the area of their natural distribution, but mixed stands should be maintained in order to insure the continued fertility of the soil.

23. FORMATION OF STANDS

23.1. *Natural Regeneration*

See also *For. Abstr.* 9 (No. 1288).

[832]. 23.1 (498) : 22.1 : 11.22. VLAD, I. Regenerarea naturală in margine de masiv. **[Natural regeneration on the margin of felling areas.]** *An. Inst. Cerc. Exp. for., București (Ser. I)* 8, 1942 (30–86). [Rum.g.] D.S.I.R.

An account of the influence of climatic conditions on natural regeneration on the margins of felling areas, with special reference to conditions in Roumania. The most suitable silvicultural systems for that country are discussed.

[833]. 23.1 : 12.25 : 32.29.2. LACHAUSSÉE, E. La régénération de l'épicéa en haute montagne. **[Spruce regeneration at high altitudes.]** *Rev. Eaux For.* 85 (5), 1947 (281–302). [F.]

The author first reviews the results of earlier research on the regeneration of Spruce in the high Jura (above 1,200 m.) and then gives an account of observations made following a particularly abundant seedfall in the autumn of 1942. Inventories were made on selected plots one, two and three years after seedfall, and the soil was periodically tested for pH. These observations established the following facts. (1) Spruce is fertile at 1,300–1,400 m. all over the mountain range except at the summit. Seed is of good quality, and germination and growth take place in good conditions, even on the forest floor. At the end of the first summer there was still a good density of seedlings, in places as many as 50 per sq.m. (2) Seedlings growing on old stumps persist without appreciable loss and seedlings of all ages are to be found, corresponding to seed years, in spite of extremely high acidity amounting to as much as 4·4–4·7. (3) There were no Spruce seedlings in patches of *Mulgedium* and under dense cover of Beech coppice shoots, though the soil was slightly acid. (4) On a neutral soil with herbaceous cover there were 15–52 seedlings per sq.m. after the first summer, but many of them were wilting and during the following winter up to 66 per cent. of them disappeared, leaving no traces; after the second winter, survival was only 4–20 per cent. (5) On an acid soil (pH 4·0) with herbaceous cover in a little snow valley, there were 27 seedlings after the first winter besides others of 5, 10 and 20 years. After the 2nd winter there was a loss of only 18 per cent. and the survivors were very vigorous. There was reason to suppose that the acidity of the soil on this site was due to the presence of rotted wood. The author urges

the need for laboratory experiments to discover the cause of these phenomena, but meanwhile advances the hypothesis that the acidity of the rotting medium in rotten stumps or soil with a large content of rotten wood inhibits the growth of damping-off fungi, whilst on the other hand rotted wood does not have the inhibiting effect on growth of Spruce which is exercised by ordinary acid soils. Rotted wood may be regarded as a very young soil in process of development, and its physical structure, micro-organisms, and metabolism have not yet been studied. It is suggested that group regeneration of Spruce would be obtained in mountain areas by scattering the rotten wood of stumps or wind-blown trees to a depth of 5–10 cm. or more simply and cheaply by piling slash so as to form spots of rotted wood.

[834]. 23.1 : 12.26–8 (54) : 12.19.2. GRIFFITH, A. L. **India's tropical wet evergreen forests.** Forest Research Institute, Dehra Dun. 1947. pp. 7. [5th British Empire Forestry Conference, Great Britain, 1947.]

Outlines the methods of encouraging and dealing with natural regeneration, which had been evolved up to 1939. [Cf. *For. Abstr.* 6 (157).]

[835]. 23.1 : 12.26–8. PETCUȚ, M. Contribuțiuni la studiul regenerărilor naturale a arboretelor pure de stejar pedunculat. [**Contribution to the study of natural regeneration in pure stands of *Quercus robur*.**] *An. Inst. Cerc. Exp. for., Bucuresti (Ser. I)* 7, (1941) 1942 (160–77 + plate). [Rum.g.] P.R.

To bring about good natural regeneration in high forest of Oak (*Quercus robur*) the seed cutting should be completed in the autumn of the full mast year. The second and final cutting should follow two years at latest after natural regeneration has taken place.

23.2. *Artificial Regeneration*

[836]. 23.2 : 12.26–8 (410) : 21 : 24 : 22.2 : 27. **The establishment of hardwoods by sowing or planting.** *For. Operat. Ser. For. Comm., Lond.* No. 2, 1937. pp. 36.

Describes the methods that have proved most satisfactory over a period of 25 years for the raising and establishing by direct sowing or planting of Oak, Beech, Ash, Sycamore, Sweet Chestnut, Birch, Alder. There is also a chapter on the treatment of coppice woods and devastated woodlands. [Cf. *For. Abstr.* 9 (No. 877).]

23.23. Sowings

See also *For. Abstr.* 9 (No. 1288).

23.23.1. *Seed Procurement, Treatment, and Testing*

See also *For. Abstr.* 9 (No. 1276).

[837]. 23.23.1 (97). SMITH, C. M. **Seed, seed supplies and silviculture.** State Forest Service, Wellington, N.Z. 1947. pp. 19. [5th British Empire Forestry Conference Great Britain, 1947.]

The writer first points out some of the difficulties hindering the practical application by silviculturists of the maxims of geneticists, and then describes some desirable improvements in practice, e.g. explicit seed prescriptions in working plans, which should be made at least 5 years ahead; outright denunciation of so-called 'selective logging'; use of carefully selected wilding stock as an emergency measure when failure of seed years or other natural phenomena interrupt the sequence of natural regeneration programmes; payment of royalties for collection of seed of good origin and quality (poor-quality stands, however copious their seed crop, should be closed to seed collectors). If every Empire unit of forestry would seriously collect its own seed crops to supply itself and other Empire units, following practical precepts for improvement and abandoning malpractices and indifference in seed matters, the Empire could be both self-supporting and forest-improving in this respect. A chain of Empire seed organizations in which large-scale seed supply would be the primary activity and research and tree breeding an obvious corollary, could be established at small cost. [Cf. *For. Abstr.* 9 (Nos. 760–3).]

[838]. 23.23.1 : 12.26–8. CROCKER, W., THORNTON, N. C., and SCHROEDER, E. M. **Internal pressure necessary to break shells of nuts and the role of the shells in delayed germination.** *Contr. Boyce Thompson Inst.* 14 (3), 1946 (173–201).

The authors first review the previous literature and then describe a method for determining directly the internal pressure necessary to rupture intact fruits after they have been

exposed to a variety of soil moistures and temperatures. Walnuts, Hickory nuts and butternuts were used for the tests. A hole was drilled through the shell and the hole threaded with a tapering male screw. A hollow tap with tapering threads, attached to a hydraulic pump, was screwed firmly into the hole, and pressure was applied by pumping water into the nut; a gauge on the pump enabled the breaking pressure to be read. Details are given of the results of the experiments. The pressure necessary to burst shells decreased progressively during storage in moist soil, but the decrease was more rapid at low than at high temperatures. On the other hand, the weakening of the dehiscent layer joining the two halves of the shells is much slower at low than at high temperatures, and in natural conditions this is probably a controlling factor in germination. There is some evidence that soil organisms are effective in weakening the dehiscent layer.

[839]. 23.23.12 : 12.25 : 21.8 : 12.11.21. [**Effect of drought on cone dehiscence.**] *Rep. N.Z. For. Serv. 1945–6*, 1946 (22).

Pinus radiata normally carries several seasons' (sometimes as many as 10 or more) crops of cones unopened and it has always been possible in New Zealand to collect good seed from unopened cones at any season of the year. The seed collectors of late March, 1946, however, found that all cones of the species had opened and shed their seeds. The season, though dry, was not one of extremely high temperatures. The difference from normal was in the prolonged spell of drought and of low humidities. It would appear that for *P. radiata* at least, and probably for many other conifers, it is these factors rather than temperature which are critical for cone dehiscence.

[840]. 23.23.15 : 12.25 [**Seed storage in New Zealand.**] *Rep. N.Z. For. Serv. 1945–6*, 1946 (14–5).

Tests on storage of indigenous and exotic tree seed are still in progress. Preliminary examination suggests that cool storage is more satisfactory than storage at room temperatures. Kauri [*Agathis australis*] seed stored at room temperatures (33–78° F.) had completely lost its germinative capacity in 2 years, while that kept at 35–40° F. for the same period still had a germinative capacity of 64 per cent. of the original test. *Pinus radiata* seed, however, showed no apparent difference related to storage temperature.

[841]. 23.23.15 : 44.3. MEULI, L. J., THIEGS, B. J., and LYNN, G. E. **The zinc salt of 2,4,5-trichlorophenol as a seed fungicide.** *Phytopathology* 37 (7), 1947 (474–80).

The zinc salt of 2,4,5-trichlorophenol has been found very effective as a fungicide for seeds and superior to other phenol derivatives tested. The most effective concentration range seems to be 30–50 per cent. combined with an inert diluent. Dosages have been established for only a few species, but it appears that the usual dosage recommendation of 2–4 g. per kilogram for large seeds may be generally applicable. In addition to reducing pre-emergence killing of seedlings by soil-inhabiting fungi, this fungicide has also effectively reduced seedling infection when seed naturally infected by a fungus is treated before planting. *From authors' summary.* [Cf. *For. Abstr.* 9 (No. 1276).]

[842]. 23.23.15 : 12.25. LESLIE, A. P. **Coated seeds for forest renewal.** *Proc. Woodl. Sect. Canad. Pulp Pap. Ass.* 29, 1947 (37–8). *Woodl. Sect. Index* No. 901 (F–2). [Dep. of Lands and Forests, Ont.]

Experiments are being carried out in Ontario on the use of coated seeds in aerial sowings of White Pine, Red Pine and White Spruce. The process of applying the successive thin layers of adhesive and powder (tumbler method) to the seeds is briefly described. The basic materials used in the coating are powdered feldspar and fly ash.

Among the advantages of plain coating are: improvement in the keeping qualities of the seed; germination without soil covering when moisture and temperature conditions are favourable; and decreased liability to attack by rodents. The addition of repellents and fungicides to the coating further increases the margin of protection.

Estimates are given of the cost of preparing and sowing coated seeds.

[843]. 23.23.19 : 12.25. VOYCHAL, P. I. K voprosu o sortirovanii semyan eli i sosnȳ. [**The grading of Spruce and Pine seed.**] *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 77–83. [Russ.]

A statistical study of variation in characteristics of seed of Pine [*Pinus sylvestris*] and Spruce [*Picea abies*], including a factor $K = \frac{10\,F}{Q}$, where Q is the weight in mg. and $F = \sqrt[3]{(a\ b\ l)^2}$, a, b and l being respectively the thickness, breadth and length in mm. The results (tabulated) are summarized as follows:—(1) For both species, seed from different localities showed no more variation in individual seed weight than that from a single locality. Variation of dimensions was almost equal in the two species and was appreciably less than that of weight. Specific gravity varied considerably, but not so much as weight. The factor K was by far the most variable and thus probably the most acceptable characteristic for seed grading. The variation of all the characteristics noted was roughly equal in the two species; thus a uniform grading procedure should suit both. (2) Correlations between the characteristics studied were weak or non-existent except in the case of K, which showed considerable correlation with both weight and specific gravity. As seed weight is a good index to viability, this confirmed the utility of K for grading. (3) Further possible correlations with germinative capacity, germinative energy, dormancy and soundness of seed (for Pine, only the last-named) were examined. The factor K again showed the best correlation. Correlations with linear dimensions gave a confused picture and need further research.

23.23.3. *Methods of Sowing*

[844]. 23.23.3 (729.5). MARRERO, J. **The proper depth and kind of covering for seeds of several tropical hardwoods.** *Carib. For.* 8 (3), 1947 (213–36). [E.span.f.]

Report on a study carried out in 1938 in Puerto Rico, to determine the proper depth and kind of material to be used for covering seeds of 10 tropical species. The materials used were river sand, compost, and subsoil, of which the first two were found to be the most satisfactory. One-half to ¾ in. of compost is a good cover for most species; ¼ to ½ in. of cover should be used with sand, germination dropping rapidly if more than ½ in. is used. *From author's summary.*

[845]. 23.23.3 : 12.26–8. LUPE, I. Semănarea ulmului. [**Sowing Elm.**] *An. Inst. Cerc. Exp. for., Bucureşti* (*Ser. I*) 8, 1942 (182–93). [Rum.g.] D.S.I.R.

Methods of sowing Elm seed, particularly in the steppes, are dealt with. Seeds should be planted in a well tilled soil and covered with a thin layer of sand or earth and with straw or green twigs until they shoot. They should be watered until the plants have two or three leaves in addition to the cotyledons. The covering is then removed, but should be retained between the rows.

23.24. Formation of Stands by Planting

[846]. 23.24 : 12.26–8 (410). LE SUEUR, A. D. C. **The replanting of Beech woods.** *Ctry. Life, Lond.* 96 (2479), 1944 (118–9). O.B.

The difficulties attending the satisfactory re-establishment of Beech woods in Britain by natural regeneration are briefly discussed. Except in the case of woods managed chiefly for amenity purposes or those situated on exposed slopes, propagation by means of transplants is generally preferable. The practice of including conifers in Beech plantations to cheapen costs and provide earlier returns is almost universal. A preponderance of conifers decreases the power of selection for the final crop, and a 50-per-cent. mixture should not be exceeded.

23.24.2. *Methods of Planting*

[847]. 23.24.2 : 07.7. TRENK, F. B., and BRUHN, H. D. **Design and use of mechanical tree planters.** *J. For.* 45 (6), 1947 (408–13).

After a review of the general principles involved in the design of mechanical tree planters, the authors describe a machine designed at the Wisconsin Agricultural Experiment Station for use in light soils. Several counties in the state have these tree-planting machines available on rental to farmers or other landowners where the land is adapted to machine planting and the number of trees to be planted (a minimum of 5,000) justifies its use.

[848]. 23.24.2 : 12.25. **Douglas-Fir silviculture and regeneration.** *Rep. Pacif. Nthwest. For. Range Exp. Sta. 1946*, 1947 (19).

During the summer of 1946 a check was made on the results of planting with the Miller planting tool [cf. *For. Abstr.* 8 (No. 237)]. The tool proved to be 14 per cent. faster than the grub hoe in planting, with first-year survival on north slopes slightly better (94 compared with 93 per cent.), but on south slopes significantly poorer (83 compared with 94 per cent.). Fertilizers and hormones used with the tool-planted trees failed to improve survival and in some cases proved lethal. The conclusion is that the Miller tool holds some promise, but that techniques for using it need working out.

23.24.3. *Spacing*

See also *For. Abstr.* 9 (No. 816).

[849]. 23.24.3 : 12.25. MUNGER, T. T. **The spacing in plantations.** *For. Res. Notes Pacif. Nthwest. For. Range Exp. Sta.* No. 34, 1946 (3–4).

Data showing the effects of different spacings (4×4, 5×5, 6×6, 8×8, 10×10 and 12×12 ft.) on the growth of Douglas Fir at the Wind River Experimental Forest during the first twenty years of stand history.

The following observations were made: (1) The average diameter increases with width of spacing, and in the 12×12 ft. plot is about twice that on the 4×4 plot. (2) The wider the spacing, the greater the average height of all trees. (3) The heights of dominant trees are more nearly alike for all spacings than are the average heights of all trees. (4) The closer the spacing, the greater are the basal area and cubic volume. (5) There is a progressive increase in crown width from close to wide spacing. (6) The diameter of the limbs at breast height is progressively greater with wider spacing. (7) The growth of bracken, annuals and shrubs is much greater with the wide spacing.

The relative advantages of close and wide spacings are very briefly discussed.

23.26. Plant Rearing. Nursery Practice

See also *For. Abstr.* 7 (Nos. 756–8).

[850]. 23.26 : 12.11.23 : 12.26–8. ZEPALOV, S. M. Fazy rosta seyantsev kak osnova ikh agrotekhniki. **[Growth phases of seedlings as a basis for the technique of cultivation.]** *Nauchnyy Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 151–62. [Russ.]

The growth phases of first-year seedlings of *Ulmus effusa* in the Shakhmatov nursery, Chkalov Province, were analysed on the basis of increments in dry weight of organic matter of individual organs and of the plants as a whole. Maximum-rate accumulation of organic matter proceeded in the sequence—cotyledons, leaves, stem and root system; provided that time of sowing was the same the incidence of these phases was relatively constant, in spite of different watering treatments, and the greatest increments of organic matter for the plants as a whole occurred in the latter half of the summer. A comparison of the dry matter per cent. (based on total dry weight per plant = 100) in individual organs throughout the growing season, revealed that whereas the figure for stems remained almost constant, there were three distinct phases in which (*a*) cotyledons showed the highest percentage for a brief period, (*b*) the percentage for the leaves rose rapidly to a maximum, with a simultaneous rapid fall in that for the cotyledons to nearly zero, and a more gradual fall in that for the root system, until (*c*) the percentage for the leaves declined fairly rapidly, with an equally rapid rise in that for the roots. Though actual data are for the most part lacking, it is broadly true that in (*a*) the requirements of mineral nutrients will be at a minimum, in (*b*) water, mineral nutrients and N will be required in quantity, while in (*c*) they will fall again, as this phase will involve mainly a redistribution of metabolites. On this basis a tentative calendar is drawn up for first-year *Ulmus effusa*, showing watering from June to August, N fertilizing in June, P fertilizing in May–July and K in June–July.

In the absence of other clear external characters, the number of internodes per seedling was examined as an index to phase of growth. It was found that the number of internodes was related to (i) time of sowing, and (ii) watering, but for identical sowing times the effect of different watering treatments differed by only 2 internodes at the close of the growing season. Tabulation of internode number against phase of growth indicated that the onset of rapid dry-matter increment occurred for leaves at 7–10 and for roots at 8–13 internodes. Taking dry matter per organ in

percentage of that per whole plant as the basis, and disregarding certain late sowings as quite exceptional in practice, but considering (1) watering at 1,381 cu.m./ha. (2) watering at 3,173 cu.m./ha., the beginning of rapid dry-matter increment in the root system occurred at 5 internodes for (1) and at 7 internodes for (2) and the sharp decline in that of the leaves coincided with respectively 11 and 13 internodes, these being the final internodes for the season. The formation of the 5th internode was practically coeval for both treatments, but that of the 11th was 10 days later with (1) than with (2). Sampling for number of internodes thus enables growth phase to be determined independently of calendar dates and the concomitant variation in weather from year to year.

[851]. 23.26 : 12.25. CROMER, D. A. N. **The development of a nursery technique for Hoop Pine on the Eastern Dorrigo.** *Aust. For.* 10, 1946 (22–9).

Experiments have shown that under the climatic conditions of this district of New South Wales a high-shade type of nursery is necessary. If the site is subject to severe frost, the temperature must be maintained above 23° F. Better stock was produced by broadcast sowing than by drill sowing or transplanting. It is essential to shade plants after tubing. November is the best month for planting. In view of the extra cost of transplanting and the better nursery growth of broadcast seedlings, the weight of evidence is in favour of using broadcast stock in spite of its inferiority to transplants in frost-hardiness. [Cf. *For. Abstr.* 8 (No. 815).]

[852]. 23.26 : 12.25 (931). **Nursery operations.** *Rep. N.Z. For. Serv. 1945–6*, 1946 (13–14).

Removal of Larch and of Douglas Fir thinnings from a stand originally Larch/Douglas mixture, resulted in a dense advanced growth of Douglas Fir seedlings. Some 430,000 of these were lifted and lined out in an adjacent 'flying nursery', and an excellent crop of 1/1 trees has been obtained at the cost of a single year's cultivation. The procedure is being repeated.

[853]. 23.26 : 23.24.1 (729.5). MARRERO, J. Efectos de la poda radicular de dos especies forestales. **[The effect of root pruning on two forest species.]** *Carib. For.* 8 (3), 1947 (241–4). [Span.e.]

High temperature and high humidity in Puerto Rico result in active vegetative growth in the nursery, an undesirable condition which may affect survival. Seedlings of *Hufelandia pendula* and *Ichthyomethia piscipula* were root-pruned in place, and planted out after 6 weeks in the nursery. The effect of treatment on survival of transplants was obscured by a drought but it was clear, from comparison with untreated controls, that root pruning curbs both top and root growth in the nursery. Further experiments on survival are planned.

[854]. 23.26.4 (478). LISIN, S. S. Sevooborotŷ v agrolesomelioralivnŷkh pitomnikakh. **[Crop rotations in nurseries for agricultural forest plantation work.]** *Nauchnŷ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 143–50. [Russ.]

Deals with the preliminary results for 1941–42 of trials begun in 1941 on poor chernozem (medium clay-loam) at the Shakhmatov nursery, in the drought region of the trans-Volga steppe, Chkalov Province.

(i) Average soil moisture from periodic samplings of the top 30 cm. was highest for ground kept for two years in bare fallow and decreased for that under the various woody species in the order *Caragana arborescens*, *Ulmus pinnato-ramosa*, *Pyrus malus*, *Fraxinus americana*, *Quercus robur* and *Acer negundo*, as first-year seedlings, and in the order *Acer tataricum*, *Ulmus effusa*, and *Betula verrucosa* as two-year-old seedlings.

(ii) The average nitrate content of the soil was highest for the two-year-old bare fallow and decreased with species in the order *C. arborescens*, *U. pinnato-ramosa*, *F. americana* and *A. negundo* as first-year seedlings, and in the order *U. effusa*, *B. verrucosa* and *A. tataricum* as two-year-old seedlings.

(iii) Best yields of I-grade seedlings were obtained from the following rotational combinations:—*C. arborescens* after one-year-old *U. pinnato-ramosa*, *P. malus* or fallow (manured or not); *A. negundo* after one-year-old *A. negundo*, *U. pinnato-ramosa* or *C. arborescens* (fallow, manured or not, gave poorer results); *F. americana* after one-year-old *C. arborescens*, *U. pinnato-ramosa* or *P. malus*; *U. pinnato-ramosa* after one-year-old *U. pinnato-ramosa*, *P. malus*, *F. americana* or *C. arborescens*

(unmanured fallow gave poor results, while manured fallow gave yields somewhat above those for a preceding crop of *P. malus*).

23.27. Arboriculture

See also *For. Abstr.* 9 (No. 1249).

[855]. 23.27 : 38.2 : 11.48.3 : 12.11.14 : 21.2 (42.1–8). WARD, W. H. **The effects of fast growing trees and shrubs on shallow foundations.** *Repr.* from *J. Inst. Landscape Archit.* [1947?] pp. 12.

Observations on the effect of trees in causing shrinkage of clay soils in the London area with consequent damage to shallow-founded structures such as roads, pavements, kerbs, walls and buildings. The shrinkage zone reaches as far as the most remote roots of the trees, and the depth of drying commonly extends to 10 ft.

There is evidence to show that, at least during a certain period in the growth of fast-growing trees, there is a net depletion of the soil moisture. From a general review of the literature it seems likely that the water requirement of trees such as Poplar is at least 12,000 gallons per annum. As the tree becomes more mature its root system tends to adjust itself to the amount of rainfall available and moisture requirements may be met without further storage depletion. Poplars 10–20 years old appear to cause more damage to houses by soil shrinkage than do mature trees of about 50 years. When several trees are planted close together damage may be accentuated by the root competition for moisture. Trees planted near houses or impervious road surfaces will tend to deplete the moisture from the covered zone with consequent large shrinkage movements. White, Black and Lombardy Poplars, Elm, and certain varieties of *Cupressus* have been responsible for most of such damage to dwelling houses in the London area.

23.3. *Afforestation*

See also *For. Abstr.* 9 (Nos. 738, 743, 745).

[856]. 23.3 (410). ROBINSON, SIR R. L. **The technique of afforestation in Great Britain.** H.M. Forestry Commission, London. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

The object of this paper is to trace the main developments in technique during the 27 years of the Forestry Commission's existence. No attempt is made to treat the subject in detail.

[857]. 23.3 (45 : 612) : 12.26–8 : 11.62.11. PAVARI, A. La ginestra come pianta forestale. [***Spartium junceum* as a forest plant.**] S. A. Arte della Stampa, Rome. [1941?] pp. 18. [It.]

A general account of the place of *Spartium junceum* in natural succession in the Mediterranean basin and particularly in Italy, where the *Ginestretum* represents an early stage in succession or a relatively late stage in regression. Its favourite habitat is a volcanic soil but it has great adaptability and its powerful and widespread root system can penetrate the smallest rock fissures. It is, for example, the principal pioneer species on the lavas of Vesuvius and Etna. These qualities fit it for the rôle of preparatory species in reforestation and for the fixation of dunes and protection of steep slopes. Many examples are cited of the advantageous use of Brooms (particularly *S. junceum*) in the reforestation of mountain slopes, particularly volcanoes. The usual practice is to sow the Broom between the planting rows; it serves the double purpose of stabilizing the *lapilli* (small fragments of lava) and shading the young trees. At a later stage the Broom has often to be cut to prevent its impeding the development of the plantation. *S. junceum* has also been widely used, particularly in Calabria and Sicily, for stabilizing steep slopes liable to landslides, particularly those with clay soils, and in Tripolitania for the fixation of dunes, being sown inside the fences of *Impeŗata cylindrica* which are first established.

[858]. 23.3 (478?) : 11.62.11 : 24.4 : 23.21. SHAPOSHNIKOV, A. P. Rost i vliyanie na urozhay protivoerozionnŷkh lesnŷkh nasazhdeni tsentral'noy lesostepi. [**Growth and influence on crop yields of tree plantations for erosion control in the central forest steppe.**] *Nauchnŷ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 82–90. [Russ.]

(i) Studies on choice of species have been made at the Novosilsk experiment station on the following site types: (A)—The upper, more gradual slopes of catchments with dark-grey and grey forest soils (medium to heavy clay-loams, relatively good soils for both agricultural and forest crops). (B)—The lower slopes of catchments, with dark-grey, and some grey, forest soils (medium to heavy clay-loams, subject to fairly severe erosion, with gullying

and frequent exposure of the parent material), with a further subdivision into (B1) sunny and (B2) shady aspects. (C)—The banks of ancient watercourses and modern ravines, with predominantly light-grey, medium to heavy clay-loams; subdivided into (C1) sunny slopes of old watercourses, most often eroded to the parent material; (C2) shaded slopes of the same, with relatively little erosion; (C3) sunny modern ravine-sides; (C4) shady modern ravine-sides. Species good on all types were *Betula verrucosa* and *Pinus sylvestris*; those good on the majority of the types were *Alnus glutinosa*, *Caragana arborescens*, *Corylus avellana*, *Larix sibirica*, *Lonicera* [*tatarica*?], *Picea abies*, *Pinus strobus*, *Populus suaveolens*, *P. tremula*, *Quercus* [*robur*?], *Sambucus nigra* and *Tilia* [*parvifolia*?]. Species found useful on certain types were *Acer campestre* on C2 and 4 (poor on remainder); *Cornus mas* on C1–2; *Fraxinus excelsior* on B2 and C4 (poor on A and C1–3); *Hippophaë rhamnoides* on C3–4; *Pinus montana* on B2 and C1; *Populus alba* on C2, *P. berolinensis* on B2 and C1; *P. canadensis* on C1 and 4; *Prunus cerasus* on C4 (poor on C1–2), *P. fruticosa* and *P. spinosa* on C1; *Salix caprea* on C1–4, *S. fragilis* on B1 and C3; and *Sorbus aucuparia* on A. Further species found very poor on some types were *Acer negundo* and *A. platanoides* on A and B1–2, *Rubus idaeus* and *Sambucus racemosa* on C3, and *Ulmus effusa* on A and C1–4. Mattock-hoeing for the first 3 growing seasons [apparently done on all but the ravine-side sites] effected all-round improvements in early growth but was not essential to establishment in all cases. Planting in spring gave better results than autumn planting.

(ii) In 1937, experiments were started on the influence of field shelterbelts—chiefly Oak 3·5–4 m. and Birch 7–8 m. tall—on crop yields. Preliminary results indicate that the gains in yield of the zones protected by the belts have been 37·5 per cent. for rye (grain), 24·8 per cent. for oats (grain) and 39 per cent. for clover (hay). Judged by the clover yields the influence of the belts is felt to as much as 100–120 m. distance. In 1941, wheat grown between 'snow-retainer' contour belts—3·5 m. wide, 4–5 m. tall, and spaced 100–120 m. apart—showed a gain in yield (grain) of 48·5 per cent. for a zone embracing 50 m. up-slope and 50 m. down-slope from the belts, this coinciding with the zones of deepest snow cover in the preceding spring.

[859]. 23.3 (478) : 11.62.11 : 23.21. Braude, I. D. Assortiment porod dlya protivoerozionnoy melioratsii v Stalingradskoy oblasti. [**Choice of species for erosion control in Stalingrad Province.**] *Nauchnŷ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 91–5. [Russ.]

Notes on the growth of various trees and shrubs planted (from 1903 onwards) for erosion control in and along the brows of seasonal watercourses near Kamŷshin, Stalingrad Province, on chestnut earths (often buried by sand) in the dry steppe zone. The ravines presented habitats differing both in soil—eroded and dry at the top and middle of the banks; moist debris at the foot and bottom—and, particularly where the banks were steep, in degree of insolation.

The best all-round species was *Robinia pseudoacacia*, which is especially recommended for sunny eroded banks. On shady eroded banks the same species plus *Pyrus malus*, *P. communis*, *Tilia parvifolia* and *Ulmus foliacea* did well, and on the bottoms Poplars (*Populus nigra*, *P. n.* var. *italica*, *P. balsamifera*, *P. simonii*, *P. tremula*), *R. pseudoacacia*, *Ulmus effusa*, *U. foliacea*, *Acer platanoides*, *Morus* and *Quercus* [*robur*?].

Species recommended for strip planting along the tops of ravines are:—(*a*) For buried dark chestnut earths—*A. platanoides*, *P. malus*, *Fraxinus americana* and *Quercus* [*robur*?]. (*b*) For sandy-loamy dark chestnut earths and sands—*Pinus sylvestris*, *A. platanoides* and *R. pseudoacacia*. (*c*) For eroded dark chestnut earths—*R. pseudoacacia*.

Of the shrubs, the best on all types of soil were *Lonicera tatarica*, *Caragana arborescens*, *Ligustrum vulgare* and *Acer tataricum*.

[860]. 23.3 (478) : 11.62.11 : 11.48.2 : 23.21. Mamyuk, I. S. Osvoenie Chirskikh peskov. [**Reclamation of the Chir sands.**] *Nauchnŷ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 125–42. [Russ.]

These sands, covering 900,000 ha. along the left bank of the Chir (a tributary of the Don) in Rostov Province, form three terraces with very complex soils, of which the commonest are (*a*) alluvial meadow solonets, with a humified layer 30–40 cm. thick over clays with a low water table (over 3 m. deep) on the first terrace; (*b*) sandy-loam leached southern chernozem, with a humified layer 40–60 cm. thick and a

water table at 5 m. or deeper, on the second terrace; (*c*) sandy-loam southern chernozem, with a humified layer 50–60 cm. thick and ground water at 1–15 m. deep on the third terrace. Eroded sandy soils and soils buried in sand drifts are common especially on the second and third terraces. Trials of tree species in plantations and shelterbelts have been in progress since 1907. *Pinus sylvestris* has grown satisfactorily on all of the soils and has stood up well to drought. *P. banksiana* has given more or less satisfactory growth in youth on sand, drift sand and sandy chernozem; its chief disadvantage is a crooked stem, but trials are to continue. *P. pallasiana* is recommended for medium and deeply humified soils of the second terrace in places where the ground water is relatively high (2 m.), as an admixture in stands of *P. sylvestris* and as a main crop species. It is also useful as a soil improver for lean, deep sands, owing to its abundant litter production. *P. rigida* is suitable for mixing with *P. sylvestris* on the same site types as those for *P. pallasiana*; it is peculiar in giving good coppice growth, coppice reaching heights of 2–4 m. at 8 years of age. *Juniperus virginiana* has grown almost as well as *Pinus sylvestris*, has shown a wide soil tolerance and excellent drought resistance, and can be grown in pure stands. *Quercus robur* grows satisfactorily on grey sandy soils of the first terrace and on deeply humified sandy loams in hollows of the second, but it tends to die back at 20–25 years of age; natural regeneration from seed was not observed, and stands should be regenerated from coppice before poor growth and die-back occur. Growth was poor on dark solonets of the second terrace. *Populus canadensis* has been successful on the better soils with a moderately high water table. *Robinia pseudoacacia* is good on the better soils of the second terrace; on elevations it forms crooked stems and thins out, the open crown does not suppress grass and older trees become stag headed. This species is recommended as coppice on a 10-year rotation for the production of vine props. *Ulmus pinnato-ramosa* was the best hardwood on sands, showing good growth, freedom from frost damage, and the best drought resistance of all the species tried; it is therefore recommended as the main species for sand fixation. *Rhus cotinus* is also recommended for planting on sands as a source of tanstuffs.

[861]. 23.3 (54) : 21.0. BADHWAR, R. L., DEY, A. C., and GRIFFITH, A. L. **The afforestation of dry and arid areas.** *Indian For. Bull.* (*n.s.*) *Silviculture* No. 133, 1946. pp. 51 + maps.

A list of 250 species suitable for growing in dry and arid areas, arranged alphabetically in three sections, (1) trees, shrubs and herbs, (2) Indian grasses, (3) foreign grasses, with short notes on their habit, distribution and important uses. Areas suitable for planting are indicated, and a tabular statement summarizes the recommendations made for the cultivation of each of the species. The list is an expanded edition of the one prepared for the 6th Silvicultural Conference in 1945. [Cf. *For. Abstr.* 8 (No. 256).]

[862]. 23.3 (546). MEHTA, M. L. **The afforestation of dry temperate hill slopes in Kashmir.** *Indian For.* 73 (6), 1947 (270–2). [7th All-India Silvicultural Conference, Dehra Dun.]

The area concerned has a rainfall of 27 inches, very poor, shallow soils, and was formerly subject to unrestricted grazing. Of the many species so far tried, *Robinia pseudoacacia* and *Pinus halepensis* are the most successful. Planting in contour trenches 24–30 in. wide and 18–20 in. deep has proved more satisfactory than pit planting. Planting is best done in winter on cloudy days after heavy rain.

[863]. 23.3 (548) : 23.24.1. KADAMBI, K. **Tree stumping on Chamundi Hill. (A new method of establishing tree growth on dry rocky hill slopes).** *Indian For.* 73 (5), 1947 (215–18). [7th All-India Silvicultural Conference, Dehra Dun (1946).]

Notes on afforestation of a bare and rocky hillside in Mysore, with stumps of several species of forest trees (*Garuga pinnata*, *Boswellia serrata*, *Dalbergia lanceolaria*, *Pterocarpus marsupium*, *Anogeissus latifolia*, *Cochlospermum gossypium*, *Grewia tiliaefolia*, *Albizzia odoratissima*, *Bombax malabaricum*, *Protium caudatum*, *Chloroxylon swietenia*, *Wrightia tinctoria*). Results are very satisfactory provided that planting is done early, in April or early May, before flushing. The disadvantages are (1) the high initial cost (9–12 annas or more per tree) and (2) the limited number of species (mostly of no economic value) to which it is applicable.

[864]. 23.3 (671) : 12.26–8. JACQUES-FÉLIX, H. *Adenocarpus mannii* Hook. f., essence de reboisement et de jachère arborée, pour les montagnes du Cameroun. [***Adenocarpus mannii* Hook. f., an afforestation and second-growth species in the mountains of French Cameroons.**] *Agron. trop.* 1 (11/12), 1946 (628–31). [F.]

[865]. 23.3 (711.1 : 712.1) : 11.49.2 : 21.32: 97.2 : 11.47. CROSSLEY, D. I. **The prairie farmer's woodlot—some suggestions.** *For. Chron.* 23 (1), 1947 (14–18).

It is suggested that use might be made, for the establishment of farm woodlots, of the humid depressions of submarginal lands (sloughs) which occur on almost every prairie farm, by planting them with coppicing species of Willow and Poplar. The soil in these sloughs, particularly in the middle, is often strongly alkaline, and the following methods are suggested for counteracting this condition: removal of vegetation rather than ploughing it in, a heavy treatment of manure ploughed under and well worked into the soil, and the reduction of surface evaporation by shading, mulching and cultivation. Further information is desired on the comparative alkali tolerance of trees, particularly those indigenous to the prairie.

24. TENDING OF STANDS AND TREES

[866]. 24 : 12.25 (569) : 56 : 57 : 23.24.3. GINDEL, I. **The dynamics of growth of young artificial Aleppo-Pine forests.** *Bull. agric. Res. Sta., Rehovot* No. 41, 1947. pp. 20. [E.]

Measurements made in young stands of *Pinus halepensis* in Palestine are expressed in a mean-height curve which is stable in form and has the characteristic shape of a light-demanding species. Elevation above sea level affects both stem quality and health of trees. The worst growth was found on basaltic soil or on sand dunes near the sea. Purely silvicultural considerations dictate a planting spacing of $1{\cdot}5 \times 1{\cdot}5$ m. to 2×2 m., removal only of suppressed trees until the 17–20th year, when heavy thinning should be instituted with the aim of creating a free space of about 1 m. between the crowns of the main canopy in order to enable the crowns gradually to increase in size and so compensate for the lower girth increment during the period of fast height growth.

24.1. *Cleanings*

[867]. 24.1 : 07.7. ZEHNDER, J. Über Werkzeuge für Säuberungen. [**Tools for cleaning operations.**] *Schweiz. Z. Forstw.* 98 (8/9), 1947 (333–5). [G.]

A short account of time studies made during cleaning operations in an experimental plot of Beech underplanted with Walnut, in order to determine the relative efficiency of ordinary thinning shears with a convex edge, a foxtail-type pruning saw and an Italian billhook. The shears were superior to the other tools for rapid topping up to a diameter of 30–35 mm. For felling and topping at diameters between 25 and 70 mm. the pruning saw appeared to be more suitable than the billhook.

24.2. *Thinnings*

See also *For. Abstr.* 9 (Nos. 816, 1260).

[868]. 24.25 : 12.25. MUNGER, T. T. **Thinning sapling stands of Ponderosa Pine.** *For. Res. Notes Pacif. Nthwest. For. Range Exp. Sta.* No. 34, 1946 (13–14).

The effect of thinning on dense sapling and small pole stands of Ponderosa Pine is not evident for some years, but diameter growth is later decidedly stimulated. The percentage of survival of Ponderosa Pine saplings, even in dense stands, is extraordinarily high.

24.4. *Shelterbelts. Windbreaks*

See also *For. Abstr.* 9 (Nos. 858–60, 1348).

[869]. 24.4 (45) : 12.25 : 12.26–8. PAVARI, A., and GASPARINI, M. L'azione di difesa dei frangiventi sulla coltura granaria. [**The protective effect of windbreaks on cereal cultivation.**] Mariano Ricci, Via S. Gallo 30, Florence. 1943. pp. 34. [It.]

A report on studies made on the *bonifica Mussolinia* in Sardinia and in the Pontine Marshes between 1939 and 1942, in order to ascertain the effects of shelterbelts on the growth of cereal crops. Measurements were made on a number of plots and the data obtained are set out in a series of tables showing variety of wheat, distance from windbreak, height and diameter of straw, length, diameter and number of ears, production per ha. Particular attention was given to the degree of

root competition exercised by the trees of the windbreak and the distance over which it occurred. It was found that root competition detrimental to the field crop was exercised by Eucalypts over a maximum zone of 10–15 m. There was no evidence of harmful competition in the case of windbreaks of *Pinus radiata*. The small loss in production in the immediate vicinity of Eucalypts is, however, largely compensated for by the increased production of the rest of the field. In Eucalypt windbreaks about 10 m. high and 30 m. wide, improvement in the crop begins at a distance of 20 m. and reaches a maximum at 60–90 m. distance; with windbreaks of less than 5 m. high the maximum growth occurs at 30 m. distance. With *Pinus radiata* 3–6 m. high, the beneficial influence of the windbreak begins in immediate proximity to the windbreak and extends over a distance of 90 m. Windbreaks of 'Canadian' Poplar 10 m. high and 30 m. wide gave a protected zone of 150 m. or more. A network of shelterbelts gives far better protection than a system of parallel belts at right angles to the prevailing wind. [See also *For. Abstr.* 8 (No. 2418).]

[870]. 24.4 (478) : 11.62.11 : 11.49.1 : 23.21.
D'YACHENKO, A. E., and ZEMLYANITSKI, L. T. Merȳ bor'bȳ s chernȳmi buryami v Bashkirii. [**Measures against dust storms in Bashkir.**] *Nauchnȳ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 4–33. [Russ.]

According to the author's observations, the soils especially susceptible to wind erosion are carbonate chernozems of various textures (chiefly on rather steep slopes) found in the eastern part of the dust-storm region, and shallow chernozems (chiefly on plateaux and high terraces) in the western part. The properties and profiles of these soils are discussed in some detail. Thick, leached, and degraded chernozems and grey forest soils are not subject to wind erosion. Blowing of the erodible soils begins at wind velocities of 5–7 m./sec. at 15 cm. above ground level. Dust storms, which are caused by south-west, south and west winds, usually occur in early spring, sometimes in autumn and rarely in summer; hence, in contrast to previous studies, those here reported were concerned with the influence of shelterbelts in the leafless condition (in spring) on wind velocity at 15 cm. above ground level. In the following results, distances are expressed in 'heights' = units equivalent to the height of the shelterbelt:—(i) Single-row adult belts had a negligible effect, the maximum reduction of wind velocity, at 7–8 heights to the leeward, being only 16 per cent. (ii) Data for adult 3-, 5-, 10- and 43-row belts are considered in two groups since about equal protection was afforded by (A) 3- and 5-row belts on the one hand, and (B) 10- and 43-row belts on the other. For both groups the greatest reduction of wind velocity was at 15 heights to leeward. Group (A) reduced wind velocity (average for a distance of 0–30 heights) by only 25–27 per cent. and belts of this type cannot be recommended, whereas for group (B) the corresponding reduction was 47–48 per cent. (iii) Of 5- to 6-year-old plantations, a 3-row belt gave only slight wind protection (average wind reduction at 0–25 heights to leeward about 13 per cent.), a 6-row belt was more, and a 9-row belt the most effective (the corresponding reduction for the last-named was more than 26 per cent.). Taking account of wind reduction to windward as well as to leeward, the 9-row was almost twice as effective as the 6-row belt. From (ii) and (iii) it is concluded that 9- to 10-row belts are the most suitable for the region. (iv) The efficiency of 5- to 6- year-old shelterbelts as dust retainers varied with the number of rows (all spaced 1·5 m. apart) and the type of plantation. With a single row of Poplars the drift began at 1 m. to leeward, and extended for 12–15 m. with a crest height of 20–30 cm. A 3-row belt (Poplar + *Fraxinus pennsylvanica* with *Caragana arborescens* and *Sambucus* (*racemosa*?) on either side) had a drift 10–12 m. wide, with a crest height of 40–50 cm. starting from the leeward row of shrubs. In a 7-row belt (3 central rows of shrubs with 1 row of trees and 1 of shrubs on either side, consisting chiefly of *Acer negundo* and *C. arborescens*) the drift began in the windward row of shrubs, reached a crest of 120 cm. height in the 6th (leeward tree) row and extended 4 m. to the leeward of the last shrub row. Of three types of 9-row plantations all formed drifts beginning at the windward shrub margin, but: (*a*) The belt having a central tree row with 1 row of shrubs, 2 of trees and a shrub margin on either side ('tree/shrub type') had drift with a crest height of 140 cm. at the 7th row from the windward, sloping more gradually to the leeward and extending 4–5 m. beyond the leeward margin. (*b*) That of 7 tree rows with shrub margins ('tree/shrub-margin type') formed a drift

sloping about equally to either side, with a crest height of 100 cm. between the 7th and 8th rows and extending 7–8 m. beyond the leeward margin. (*c*) That of 9 shrub rows accumulated the largest drift, about 200 cm. high between the 6th and 9th rows (which were almost completely buried), sloping steeply to leeward and ending only 2 m. beyond the last row. From these results it appears that 9- to 10-row belts of the 'tree/shrub' type are best adapted to the prevention of wind erosion in chernozem areas: in transitional areas 7–8 rows should suffice and 5 rows where the chief function of shelterbelts is the protection of crops from dry winds and the even distribution of snow. (v) The optimum spacings between main shelterbelts in Bashkir are estimated to be 225–300 m. on carbonate chernozems, and 250–350 m. on shallow stony chernozems (better sites) while secondary (transverse) belts could be 1,000 m. apart. On the soils not subject to blowing the spacings could be 500–550 m. for main and 1,000–2,000 m. for secondary belts. In hilly country the belts should follow ridges, as it is at the brow of the hills that the maximum wind velocity occurs. A list is given of species suitable, worth trying, and unsuitable for shelterbelts on the soils in question. (vi) Observations were made on the reaction of various species in belts about 8 years old to partial burial in earth drifts. *Betula verrucosa*, *Acer negundo*, *Populus balsamifera*, *Ulmus* sp., *Sambucus racemosa*, *Amorpha fruticosa*, *Elaeagnus angustifolia*, *Caragana arborescens*, *Rubus idaeus et al.*, but not *Fraxinus americana*, remained healthy and showed better height growth than before burial (in many cases better in the more deeply than in the more shallowly drifted places), and very good survival. Excavations of root systems proved that in all but *F. americana* (70 per cent.), 100 per cent. of trees examined had produced adventitious roots. Both stems and branches had rooted, the thinner branches rooting the more vigorously. The new roots were mostly superficial, the diameter of the root system being commonly 2–3 times that of the crown. Some branches rooted so well that they became independent plants. (vii) An experiment with snow screens [hurdles?] 75 cm. high, is also described. These gave considerable wind protection when placed in suitable formation and might well be used to shield valuable crops in the period before shelterbelts become effective.

Diagrams and tables are presented in illustration of the results.

[871]. 24.4 (478) : 11.33 : 11.14.4. GORSHENIN, N. M. Printsipy razmeshcheniya zashchitnykh lesnykh polos na pakhotnykh sklonakh. **[Principles of shelterbelt layout on arable slopes.]** *Nauchny Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 34–54. [Russ.]

This paper, which is complementary to previous studies of the effects of shelterbelts on level ground, contains summaries of various observations made on arable slopes with gradients of 2–8 per cent. at Timashev, 80 km. E. of Kuibyshev, in 1940–42. The shelterbelts were planted in 1892–95 in rectangular formation (spaced 850—1,000 × 1,300 m.) without regard to the contours, mainly for protection against dry winds in summer; by 1940–42 most of them were second-generation coppice, chiefly of *Ulmus* [*U. foliacea* and *U. effusa*?] *Acer platanoides* and locally *Fraxinus excelsior*. (i) It was confirmed that the velocity of a wind blowing up-slope increases towards the brow, whereas winds blowing down-slope decrease progressively in velocity. (ii) For the four control velocity ranges 0–3, 3–5, 5–7 and more than 7 m./sec., the reductions of wind velocity at 20 shelterbelt heights to leeward were respectively 34, 37, 38 and 40 per cent. This increase in protective effect with increasing wind velocity was, however, small compared with the range of the control velocities. In the case of dense shelterbelts, protection increased with increasing wind velocity, but only for a short distance, the effect ceasing at 10 heights to leeward, whereas with shelterbelts open below and of medium density at about mid-height, protection at a short distance to leeward decreased, but at distances of more than 10 heights increased with increasing wind velocity. Belts of intermediate structure failed to show any definite correlation of this nature. In general, it appeared that although shelterbelts on slopes of up to 8 per cent. were somewhat more effective in wind protection than those on level plateaux, the difference was unimportant. (iii) An analysis was made for the four groups 68–90°, 45–68°, 23–45° and 0–23° of the effect of the angle at which winds strike a shelterbelt. The protection given was almost halved by a change of wind angle from 68–90° to 0–23°, but between 68–90° and 45–68° the

difference in protection was small. These results do not hold for the interior of shelterbelt systems, especially if belts are disposed in rectangles: the closer the spacing of the belts, the greater is the protection afforded and the smaller the influence of the angle of the main belts to the wind. (iv) With shelterbelts spaced 850–1,000 m. apart, snow distribution on the intervening ground was very irregular, large drifts formed in the belts themselves and zones of blowing developed at a distance of 100–200 m. particularly where the large open spaces were not enclosed by shelterbelts and where shelterbelts were dense. Excluding drifts in the belts, the snow cover in such shelterbelt systems was less than on the open steppe and the belts must be considered detrimental rather than an advantage to agriculture. Shelterbelts dense below, formed deeper snowdrifts than those which were permeable below, and it is recommended that to secure an even snow distribution on slopes, the belts should be 250–300 m. apart, of 7 rows with dense crowns and with an understorey cut back every year to a height of 1·5 m. Even at spacings of 100 m., dense young shelterbelts are unsatisfactory distributors of snow and must be thinned regularly, the thinnings being used to make hurdles for catching additional snow on the open space. (v) Soil freezing was shallowest in the belts and increased progressively in depth with increasing distance from them. The correlation of soil freezing, and snow depth was less striking than it might have been had the snow been of uniform density. Measurements gave the average snow densities as 0·295 for open steppe and the spaces between belts, 0·37 for the interior and windward margin of belts, and 0·405 for the leeward margin. (vi) Data are included on snow-melt and run-off in relation to erosion. For the most part these have been reviewed by Sus [see *For. Abstr.* 7 (No. 1789), where for '0·03 m./sec.' read '0·08 m./sec.']. Particular stress is laid in the present paper on the importance of contour belts in retaining snow-water and eroded soil, and on the threat of gully formation at a distance of 15–25 m. (edge of drift) parallel with belts running up and down slopes. Even distribution of snow by main contour belts as described under (iv), with short transverse belts, not more than 1,000 m. apart, of 2–4 rows in 'avenue' formation (widely spaced both in and between rows; possibly of fruit trees), is the best solution to the problem of erosion, but may need to be supplemented in some cases by agricultural measures, e.g. basin listing.

[872]. 24.4 (478) : 23.22.1 : 11.49.1. NIKITIN, P. D. Obrabotka pochvy pod lesnye polezashchitnye polosy. [**Soil cultivation for field shelterbelts.**] *Nauchny Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 55–68. [Russ.]

Since soil moisture is a critical factor in plantation establishment under steppe conditions, soil cultivation must be much more thorough than in the forest zone. Of various methods of cultivation tried in the present study—on ordinary chernozem, southern chernozem and chestnut earth—the basic types were (1) autumn ploughing following by harrowing in spring, ploughing with a stubble plough in summer, re-ploughing in autumn, harrowing early in the spring and then planting; (2) spring ploughing followed by summer stubble ploughing, re-ploughing in autumn, and harrowing in spring before planting; (3) stubble ploughing in August, followed by autumn ploughing alone and planting in the spring.

In types (1) and (2) the first autumn or spring ploughing was made to a depth of 20–25 cm., but variations were tried in the depth of the autumn re-ploughings, ranging in 5-cm. gradations from 20 to 50 cm. Results showed that the most effective treatment for both moisture conservation and weed control was autumn re-ploughing to a depth of 25–35 cm. Such treatments gave plant survivals of 85–95 per cent. in the autumn after planting; early tending was facilitated by the relative absence of weeds, and there was no need for beating up. Cultivation of type (1) was the most favourable, as the soil could accumulate the precipitation of two autumns and winters; this treatment was particularly advantageous on the chestnut earths, and in May–June of the first growing season, soil moisture for the first metre of depth was 3–4·5 per cent. higher than with cultivation of type (3), though only slightly higher than with type (2). Although autumn re-ploughing to depths greater than 25 cm. had no marked effect on soil moisture and plant survival (provided that weeding was properly done), better weed control was achieved with the deeper ploughing.

The procedure recommended for good

shelterbelt establishment is stubble ploughing to 4–5 cm. immediately after harvesting, followed by ploughing to 20–22 cm. in autumn, early spring harrowing and three cultivations with a stubble plough to depths of respectively 6–8, 8–10 and 10–12 cm., re-ploughing in August or September in the chernozem zone to 27–30 cm. or on the southern chernozem and chestnut soils to 30–35 cm., and final spring harrowing before planting. On ordinary chernozems, cultivation of type (2) may be satisfactory if the remaining operations are carried out as specified, and in areas where weed growth is poor, even type (3) may suffice.

[873]. 24.4 (478) : 23.2 : 12.26–8. PANFILOV, YA. D. Agrotekhnika zashchitnȳkh nasazhdeni v oroshaemȳkh khozyaystvakh. **[Technique of establishing protective plantations on irrigated farms.]** *Nauchnȳ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 69–81. [Russ.]

A report chiefly on experimental shelterbelt plantings of Poplar (2-row 'avenue' type; for protection against dry winds and for prevention of snow blowing), made since 1935 on the berms of raised irrigation canals in the Ershov district of trans-Volga Saratov, on dark chestnut earths. (i) Planting (of unrooted cuttings) without soil cultivation, gave inferior results as regards both survival and height growth, and of three methods of cultivation, planting in holes was rather better than general cultivation of the whole area. All cultivated plots very quickly became overgrown with weeds. (ii) Owing to the presence of seepage water, there was little difference between early May and early June plantings, but July plantings showed considerable mortality. (iii) Of first-year weeding treatments, complete hoeing was the best, while hand weeding or no weeding gave poor results, indicating that in spite of adequate moisture the plants required loose soil and freedom from competition. Between weeding treatments and no weeding in the second year there was no significant difference. (iv) Two-year-old rooted cuttings showed considerably greater survival than unrooted cuttings, but much poorer height growth, continuing to lag in succeeding years. (v) The Poplars used for berm plantations were chiefly *P. berolinensis* and *P. canadensis*; other species were tried on arable land (watered only 3 times during the growing season), but were not risked, in the absence of experience, along the canals. Of the 13 types so tried, the best appear to be *P. canadensis*, *P. pyramidalis* and *P. petrowskyana*, though further trial is necessary. *P. simonii*, *P. moscoviensis* and *P. monilifera aurea* were unsuitable, the first two on account of frost damage, the last because of poor growth rate. (vi) Fruit- and berry-bearing plants are also being tried but their future is problematical until their bearing capacity is known. *Morus alba*, however, appears of definite promise for growing as a shrub on berms, for silkworm breeding. (vii) Coppiced Willow and Poplars were tried in the canal borrow pits. The Willows failed, but it appears quite possible to raise coppice Poplars for rods and fence posts on these poor sites, though it is noted that growth deteriorates with distance from the canal, even within the limits of a borrow pit 2·6–2·7 m. wide, owing probably to increased soil salinity with decreased access to seepage water. (viii) Trials of Poplars along field irrigation channels and roads gave poor results and more drought-resistant species must be sought for this purpose. (ix) The protective planting of banks of artificial irrigation reservoirs against wave action presents some difficulties when there are large variations in water level. A technique regarded as promising is to lay a temporary brushwood cover between high and low water levels and to plant tree Willows as large setts in this zone. Experience here and in the flood plain of the Don shows that flooding for 2 months does not affect survival though it retards height growth. (x) Trials of numerous tree and shrub Willow species were made, both irrigated and unirrigated. Those surviving over 6 years without irrigation were *Salix gmelini*, *S. stipularis*, *S. triandra*, *S. caspica*, *S. alba* var. *vitellina*, *S. alba* var. *vitellina* × *S. fragilis*, and *S. viridis*. With irrigation quite a good range of basket Willows could be grown, including *S. acutifolia*, *S. pulchra*, *S. phylicifolia* × *S. viminalis*, *S. purpurea* vars. *lambertiana* and *helix*, *S. verriviminalis* [?], *S. acuminata* and *S. undulata*.

[874]. 24.4 (71). WALKER, J. **Planning and planting field shelterbelts.** *Fmrs'. Bull. Dep. Agric. Can.* No. 139, 1946. pp. 15.

[875]. 24.4 (931) : 21.0. RODDA, T. E. **Farm shelter. [1] Local conditions determine site, direction, and type. [2] Planting**

on sea coasts to combat heavy winds. [3] **Farm shelter species for wet areas, timber, and firewood.** *N.Z. J. Agric.* 72 (3; 4; 5), 1946 (253–5, 257–9; 345–7, 349; 501, 503–5, 507). O.R.E.

24.5. *Pruning*

[876]. 24.51 : 12.26–8 : 21.2. SCHLIPPE, P. DE. Contribution au problème de la taille du Caféier Robusta, à la lumière de la théorie de sécheresse physiologique. [**Contribution to the problem of pruning *Coffea robusta*, in the light of the theory of physiological drought.**] *Bull. agric. Congo belge* 38 (2), 1947 (315–46). [F.flem.]

27. TREATMENT OF DEFECTIVE OR EXCESSIVELY OPEN STANDS

[877]. 27 (410). LAURIE, M. V. **The treatment of derelict and devastated woodlands in Great Britain.** H.M. Forestry Commission, London. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

The restoration of derelict and devastated woodlands, together with areas of uneconomic coppice, to a productive state, is a major problem facing British forestry. Such woodlands are probably over half a million acres in extent, and occur mainly in the Midlands and the South of England in detached blocks under private ownership. They have reached their unsatisfactory condition through continued neglect, followed by intensive exploitation during the war of 1939–45. The methods of replacement that are discussed include natural regeneration, conversion of suitable coppice areas to high forest, underplanting of scrub or pole crops, complete clearance and replanting, and partial clearance by the strip or group methods. *From author's summary.*

3. FOREST UTILIZATION FOREST TECHNOLOGY

[878]. 3 (410) : 07.2. **The Forest Products Research Laboratory, Princes Risborough, England.** H.M. Forestry Commission, London. 1947. pp. 13. [5th British Empire Forestry Conference, Great Britain, 1947.]

Notes contributed by the heads of sections of the Laboratory to serve as a short review of the Laboratory's research activities and as an indication of its current work.

[879]. 3 (54) : 07.2. STEWART, D. **Short review of current research work on forest products at the Forest Research Institute, Dehra Dun, India.** Forest Research Institute, Dehra Dun. 1947. pp. 9. [5th British Empire Forestry Conference, Great Britain, 1947.]

[880]. 3 (68) : 07.2. **[Work in progress at the Forest Products Institute, Pretoria.]** [? Forest Products Institute, Pretoria.] 1947. pp. 5. [5th British Empire Forestry Conference, Great Britain, 1947.]

[881]. 3 (71) : 07.2. MCELHANNEY, T. A. **Forest products research in Canada.** Dominion Forest Service, Ottawa. 1947. pp. 15. [5th British Empire Forestry Conference, Great Britain, 1947.]

[882]. 3 (73) : 07.2. HUNT, G. M. **Forest products research in the United States.** [? Forest Products Laboratory, Madison, Wis.] 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

[883]. 3 (931) : 07.2. ENTRICAN, A. R. **New Zealand State Forest Service (Branch of Forest Products): programme of work 1947–48.** State Forest Service, Wellington. 1947. pp. 50. [5th British Empire Forestry Conference, Great Britain, 1947. Cyclostyled.]

[884]. 3 (97) : 07.2. **Report of the committee on forest products research.** In *Fifth British Empire Forestry Conference, Great Britain, 1947: Summary Report.* 1947 (46–9). H.M. Stationery Office, London.

This report was adopted by the Conference, which called the attention of Governments of the Commonwealth to its recommendations, particularly to the following:—(1) That a standing Forest Products Committee as proposed by the 1935 Conference, be set up, whose functions shall include yet closer co-ordination with forestry, co-operation in extra-national investigations, and promotion of uniformity in research methods. (2) That corresponding committees should be set up for the purpose of interchange and collection of information on specific research programmes, and to co-ordinate subsequent action thereon. (3) That co-ordination of research between the forest products laboratories of the Commonwealth requires meetings of specialist officers from time to time, and that these meetings should be supplemented by such staff visits to other laboratories and forestry centres as may be possible to arrange. (4) That the importance of economic considerations in forest products laboratory programmes requires for some laboratories the appointment of officers specially trained in economics. (5) That provision should be made for the appointment of trained utilization officers to those Colonial forest departments where experimental stations do not exist.

[885]. 3 (83) : 09.7 : 09.4 : 9. HAIG, I. T., *et al.* **Forest resources of Chile as a basis for industrial expansion.** U.S. Forest Service. 1946. pp. 256 + map.

Contains chapters on the forest resource (59 pp.), national timber requirements (23 pp.), forest industries (53 pp.), a suggested forest policy (12 pp.), with a 10-page summary. The numerous appendices and tables (84 pp.) include volume tables and tables of growth on sample plots, for the principal commercial species.

[886]. 3 (87) : 90. GONZÁLEZ VALE, M. A. Estudio forestal sobre los llanos occidentales de Venezuela. **[Study of the western plains of Venezuela from the point of view of forestry.]** 3a. Conferencia Interamericana de Agricultura, Caracas. [*Publ.*] No. 10, 1945. pp. 100. [Span.e.]

The most important cabinet woods are *Cedrela mexicana* and *Swietenia candollei*. Durable constructional timbers include *Platymiscium* sp., *Pithecolobium* sp., *Lonchocarpus* sp., *Astronium graveolens*, and *Calycophyllum*

candidissimum. In the manufacture of packing cases *Tecoma pentaphylla* and *Hura crepitans* are important. Minor forest products include charcoal and flosses (e.g. kapok).

The evolution of the timber industry in Venezuela, the chief aspects of timber supply (home or foreign), timber exploitation, timber manufacture and the distribution of the finished product are discussed.

[887]. 3 : 07.7. Méthodes modernes pour l'exploitation et l'utilisation rationnelles du bois. **[Modern methods for the rational exploitation and utilization of wood.]** *Les techniques du bois* 1–3, 1947. pp. 113 + 116 + 199 + plates. [F.] Editions de la Revue du Bois et de ses Applications, Paris.

Reports presented to the International Congress for the Rational Exploitation and Utilization of Wood, held in Paris in September, 1946. Particular attention was directed towards mechanization, both in logging operations and in factories, and utilization of waste. Some of the more important papers will be found abstracted separately in the appropriate sections of this issue of *Forestry Abstracts.*

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31.0. *General Information on Woods*

See also *For. Abstr.* 9 (Nos. 808, 811).

[888]. 31.0 (54). GORRIE, R. M. **Indian timbers in war.** *Indian For.* 73 (6), 1947 (263–70).

Includes notes on timbers used for lorry bodies, horse-drawn wagons, tool handles, packing cases and containers, rifle furniture, saddlery, stretchers, pontoon and bridging stores, tent poles.

[889]. 31.0 (87). **Notes on Venezuelan timbers.** *Timb. Inform. Timb. Developm. Ass., Lond.* No. 32 [*n.d.*] pp. 4.

[890]. 31.0 : 02.1. FOGLI, O. Legnami indigeni ed esotici nei loro usi e provenienze. 3ª ed. **[Native and foreign woods: their uses and provenance.]** Ulrico Hoepli, Milan. 3rd ed., 1944. pp. 214. [It.]

[891]. 31.0 : 12.25. **Specimen woods No. 140: Fiji Kauri (*Agathis vitiensis*).** *Suppl.* to *Wood* 12 (8), 1947 (223–4).

[892]. 31.0 : 12.25. GUINIER, P. Le pin sylvestre. **[*Pinus sylvestris.*]** *Rev. Bois Appl.* 2 (4), 1947 (3–7). [F.] P.R.

[893]. 31.0 : 12.26–8. **Substitutes for Mahogany.** *Woodwkg. Industr.* 4 (5), 1947 (340–5). P.R.

Substitutes for true Mahogany from Central and South America, West Africa, Malaya and North Borneo are described with some practical hints for their utilization.

[894]. 31.0 : 12.26–8 : 01.2. **What is Roble?** *Wood* 12 (3), 1947 (75–6).

'Roble' is used with or without a qualifying adjective, from Mexico to Chile, to denote a large number of tree species belonging to a score or so of genera in 10 families. A list is given.

[895]. 31.0 : 12.26–8 : 2. Le Framiré. **[*Terminalia ivorensis.*]** *Bois For. Trop.* 1 (1), 1947 (48–52). [F.]

A short account of the taxonomy, distribution, botanical and silvicultural characters, wood properties and uses, and trade.

[896]. 31.0 : 12.26–8 (94). AUSTRALIA. **Properties of Australian timbers. Silver Wattle (*Acacia dealbata*).** *For. Prod. News Lett. C.S.I.R. Aust.* No. 153, 1947 (4).

[897]. 31.0 : 12.26–8 (94). **Properties of Australian timbers: Myall (*Acacia pendula*).** *For. Prod. News Lett. C.S.I.R. Aust.* No. 153, 1947 (4).

[898]. 31.0 : 12.26–8. **Specimen woods No. 139: White Siris (*Albizzia procera*).** *Suppl.* to *Wood* 12 (7), 1947 (193–4).

[899]. 31.0 : 12.26–8. **Specimen woods No. 136: Champak (*Michelia champaca*).** *Suppl.* to *Wood* 12 (4), 1947 (103–4).

[900]. 31.0 : 12.26–8 (66). KEEN, G. R. **West African timbers (*Entandrophragma* spp.).** *Wood* 12 (6), 1947 (172–6).

[901]. 31.0 : 12.26–8 : 2. AUBRÉVILLE, A., BESSON, A., BERENGIER, COLLARDET, PETITPAS, NORMAND, D. L'Iroko **[Iroko (*Chlorophora excelsa*).]** *Bois For. Trop.* 1 (1), 1947 (34–47). [F.]

A comprehensive study, including taxonomy, distribution, morphology, silvicultural characters, properties of wood, uses and trade. 17 references.

[902]. 31.0 : 12.26–8 (64). METRO, A. Quelques bois d'*Eucalyptus* marocains et leur possibilités d'utilisation. [**Some Moroccan Eucalypts and their possible utilization.**] *Les techniques du bois* 1, 1947 (73–6). [F.]

A brief account is given of the climate and soils of Morocco and the plantations of Eucalypts which have been made there during the past 25 years. Detailed notes are given, with the results of laboratory tests for mechanical properties, on *Eucalyptus globulus, E. gomphocephala, E. rostrata, E. robusta, E. cornuta, E. corynocalyx, E. citriodora.*

[903]. 31.0 : 12.26–8 (94). **The properties of Australian timbers. Rose Gum (*Eucalyptus grandis.*)** *For. Prod. News Lett. C.S.I.R. Aust.* No. 151, 1947 (4).

[904]. 31.0 : 12.26–8. **Specimen woods No. 138: Musizi (*Maesopsis eminii*).** *Suppl.* to *Wood* 12 (6), 1947 (167–8).

[905]. 31.0 : 12.26–8 (68 : 679). **Specimen woods No. 137: Pink Ivory (*Rhamnus zeyheri*).** *Suppl.* to *Wood* 12 (5), 1947 (133–4).

31.1. *Structure. Anatomy. Identification*

See also *For. Abstr.* 9 (Nos. 777, 1024).

[906]. 31.1. VAROSSIEAU, W. W. Structuuronderzoek Serie I. Het ontstaan van hout. [**Anatomical research. 1st series. The histological origin of wood.**] *Circ. centr. Inst. Mater. Onderzoek Afd. Hout.* No. 1, 1947. [pp. 4.] [Du.] P.R.

[907]. 31.1 : 31.2. VAROSSIEAU, W. W. Structuuronderzoek Serie I. De bouw van hout. [**Anatomical research. 1st Series. The structure of wood.**] *Circ. centr. Inst. Mater. Onderzoek Afd. Hout.* No. 2, 1947. [pp. 8.] [Du.] P.R.

[908]. 31.1. VAROSSIEAU, W. W. Structuuronderzoek Serie I. De technique van het structuuronderzoek. [**Anatomical research. 1st series. The technique of anatomical research.**] *Circ. centr. Inst. Mater. Onderzoek Afd. Hout.* No. 3, 1947. [pp. 11.] [Du.] P.R.

[909]. 31.1 : 31.2 : 33. VAROSSIEAU, W. W. Structuuronderzoek Serie I. De beteekenis van het structuuronderzoek voor de toepassing van hout in de praktijk. [**Anatomical research. 1st series. The significance of wood anatomy for practical timber use.**] *Circ. centr. Inst. Mater. Onderzoek Afd. Hout.* No. 4, 1947. pp. 9. [Du.e.fr.] P.R.

A brief summary of anatomical research, in relation especially to identification, the connexion between structure and physical properties, and between structure and wood preservation, and the use of glues.

[910]. 31.1 : 01.4. PFEIFFER, J. P., and VAROSSIEAU, W. W. **Classification of the structural elements of the secondary wood of dicotyledons, using decimal indices for classification and identification of wood species.** *Repr.* from *Blumea* 5 (3), 1946 (437–89). [Central Institute for Testing Materials, Delft.] X.

[911]. 31.1 : 01.6. **List of publications on the growth, structure, and identification of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*177 (rev.), 1947. pp. 38. P.R.

[912]. 31.1 : 07.7. LEGRAND, C. Sur quelques applications des rayons X à l'étude des bois et de leurs dérivés. [**Some applications of X-rays to the study of woods and their derivatives.**] *Les techniques du bois* 2, 1947 (29–31 + plates). [F.]

A report on the employment of X-rays in the course of research carried out at the Centre National de la Recherche Scientifique on the structure of wood and cellulose: applications based on (1) the absorption of the X-rays and their photoelectric effect (microradiography), and (2) the diffraction of the X-rays (study of wood structure and its chemical transformations).

[913]. 31.1 : 12.14.4. CORMIO, R. Morfologia interna del tronco degli alberi con particolare riguardo alla struttura del legno. [**Internal morphology of tree trunks with special reference to wood structure.**] *Repr.* from *Ingegnere* No. 5, 1942. pp. 10 + 18 figs. [It.] P.R.

[914]. 31.1 (63 : 677). FASOLO, U. Atlante micrografico dei legni dell'Africa orientale italiana. [**Micrographic atlas of woods from Italian East Africa.**] R. Erbario coloniale di Firenze. No. 1, 1939–40; 2, 1941–44, pp. 12 + 12 tbls. [It.]

Consists of two portfolios, each containing microphotographs and detailed descriptions of the structure and anatomy of 12 species of wood. For each species there are × 70 photographs of transverse, radial and tangential sections, and a × 270 photograph of a radial section. Species covered are *Juniperus procera, Ficus vasta, Olea chrysophylla, Acacia etbaica, Euphorbia abyssinica, Balanites aegyptiaca, Cordia ovalis, Zizyphus spina-Christi, Croton macrostachys, Dalbergia melanoxylon, Combretum trichanthum, Syzygium guineense, Diospyros mespiliformis, Podocarpus gracilior, Odina schimperi, Grewia trichocarpa, Nuxia dentata, Boscia salicifolia, Kigelia aethiopica, Dobera macalusoi, Lonchocarpus laxiflorus, Maba abyssinica, Erica arborea, Dombeya bruceana.*

[915]. 31.1 (666.8) : 12.26–8. NORMAND, D. L'identification des bois de la Côte d'Ivoire. **[The identification of Ivory Coast woods.]** *Agron. trop.* 1 (7/8), 1946 (361–74). [F.] E.M.B.

An extract from a work in progress (*Atlas des Bois de la Côte d'Ivoire*). The families dealt with in this instalment are Ulmaceae, Moraceae, Olacaceae, Icacinaceae, Octoknemataceae, Annonaceae.

[916]. 31.1 : 12.25 (931). ORMAN, H. R., and REID, J. S. **Wood anatomy of New Zealand *Dacrydium* species.** *N.Z. J. For.* 5 (3), 1946 (215–9 + plate).

[917]. 31.1 : 12.26–8 (82). COZZO, D. La estructura estratificada del leño de *Capparis salicifolia* Gris. **[Storeyed structure of the wood of *Capparis salicifolia.*]** *Publ. téc. Direcc. for. Argent.* No. 3, 1945 (3–6). [Span.]

[918]. 31.1 : 12.26–8. NORMAND, D. Anatomie des bois d' *Endodesmia* et de *Lebrunia.* **[Anatomy of the wood of *Endodesmia* and *Lebrunia.*]** *Bull. Soc. bot. France* 93 (7/8), 1946 (245–8). [F.] O.B.D.

[919]. 31.1 : 12.26–8. DADSWELL, H. E., and INGLE, H. D. **The wood anatomy of the Myrtaceae, I. A note on the genera *Eugenia, Syzygium, Acmena* and *Cleistocalyx*.** *Trop. Woods* No. 90, 1947 (1–7 + plates). [Division of Forest Products, C.S.I.R., Australia.]

31.2. *Physical Properties*

31.23. Weight. Specific Gravity

[920]. 31.23 : 12.25 (68) : 55 : 56. TURNBULL, J. M. **Some factors affecting wood density in Pine stems.** Dept. of Forestry, Pretoria. 1947. pp. 22 [5th British Empire Forestry Conference, Great Britain, 1947.]

Average data accumulated chiefly from dissection of 20–30 stems (of *Pinus patula, radiata* and *taeda*) from each of 5 different sites in South Africa are used in an attempt to show that variations in wood density in Pine stems, hitherto regarded as fortuitous, are actually systematic. Analysis of the data shows that whereas aggregate wood density, or the mean density across entire transverse sections, is, in normal circumstances, directly correlated with rate of growth, the density of wood formed in any particular year is directly proportionate to a function of age. The influence exercised on density by aspect, edaphic factors (with special reference to moisture), and seed selection, is also briefly discussed. A method of research based on the density/age relationship is suggested for use in further attempts at isolating the environmental factors that determine wood density.

Although in any particular year, rate of growth exerts no influence on wood density, aggregate density does vary, within the limits of silvicultural practicability, according to the width of wood imposed at different stages in the stem's development. No apprehension need be entertained regarding the production of light wood due to wide espacement in the latter parts of rotations. If the rate of growth in the earlier portion of the rotation has been high, the volume of heavy wood produced will be relatively low, but its absolute volume will be as great as, or even greater than it would have been had the rate been low, and the extra volume of light wood may be regarded as a bonus. In other words, production of a large volume of heavy wood entails acceleration of growth during that portion of the rotation in which heavy wood is naturally produced, and the larger the core of light wood upon which it is imposed, the higher will that volume in individual stems be. *From author's summary and conclusions.* [Cf. *For. Abstr.* 9 (Nos. 816, 921).]

31.27. Mechanical Strength

See also *For. Abstr.* 9 (Nos. 948, 996–1001, 1005, 1010–4, 1019, 1159–60, 1162–3, 1174, 1236–9).

[921]. 31.27 (68) : 31.0. **Timber mechanics.** *Rep. Dep. For. S. Afr. 1946*, 1947 (9).

Of eleven species tested for air screws, *Entandrophragma utile* and *E. cylindricum* were found to conform most closely to requirements. *Cordia caffra* gave exceedingly high values under impact and would be most suitable as a hammer-handle wood. A very steep radial-strength gradient was disclosed in tests made on Limba (*Terminalia superba*), which would account for the varying reports received on the strength of this wood; this is of the utmost importance in connexion with the method of selecting Izod impact samples. A comprehensive set of tests on 30-year-old *Pinus patula* also revealed a marked radial-strength gradient, which showed little sign of culminating even at 30 years of age in the butt logs. Well defined relationships were found to exist between weight and modulus of rupture and between density and age, but none could be found between rate of growth and strength or weight.

[922]. 31.27 (931). **Timber mechanics.** *Rep. N.Z. For. Serv. 1945–6*, 1946 (36–7).

Useful data on the toughness (i.e. ratio of tensile strength to compressive strength) of numerous timbers are being assembled from tests on the Denison toughness machine. The purpose of the experiments is to establish, by tests on a wide range of material, minimum and average toughness values for local species. The toughness values (relative to density) of Red Beech (*Nothofagus fusca*), locally grown Elm (*Ulmus* spp.) and Mangeao (*Litsea calicaris*) are higher than those of any other species tested to date. Softwoods in general are poorer in this quality, Larch (*Larix decidua*) giving the best values so far.

[923]. 31.27 : 12.25 (471). STREKALOVSKI, N. I. O tekhnicheskikh svoystvakh drevesiny severnoy eli. **[The technical properties of northern Spruce wood.]** *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 17–36. [Russ.]

The physical and mechanical properties of Spruce [*Picea abies*] wood were investigated for 75 trees from various forest districts of the northern Dvina basin situated between 60° 50′–61° 50′ N. and 44° 30′–49° 33′ E., where stands dominated by Spruce account for 75 per cent. of the forest area. The results (10 tables, 7 graphs) indicated that:—(i) The mean annual ring breadth for the region was 1·05 mm. at breast height. Breadth of latewood (e) in relation to breadth of annual ring (b) could be expressed by the equation $e = 0{\cdot}015b^2 + 0{\cdot}18b + 0{\cdot}01$; latewood per cent. (and mechanical properties with the exception of shear resistance) declined very slightly with increasing breadth of annual ring, but correlation was poor and significant reduction of strength occurred only at ring breadths of 1·5 mm. upwards. Correlation of strength properties with latewood per cent., which was relatively uniform in the 1,120 samples examined, was generally low and much less than in wood of Pine or Larch (which have thicker tracheid walls). It is concluded that both annual ring breadth and latewood per cent. are poor indexes to wood quality, though the first-named may be used as a preliminary, rough guide. (ii) Variation in properties with varying position of the sample in the stem was very slight in the radial direction. The same was true of variation with height (to 11 m.), except for resistance to impact bending, in which the decrease with increasing height could be up to 15 per cent. of the resistance of breast-height samples. (iii) Specific gravity was the best index to strength properties, except for resistance to impact bending and shear. The relationship of specific gravity at 15 per cent. moisture content ($\gamma 15$) to strength properties, is given by the equation $R = A\gamma 15 + B$, and values of A and B are tabulated for each of the properties studied. (iv) Radial and tangential strength in static bending may be regarded as equivalent, but for impact bending there is an average difference of 30 per cent. (based on that in the tangential plane) in favour of radial strength. (v) The present results, and a comparison with others from literature, show that, in the regions of N. Russia so far examined, Spruce more than satisfies the requirements of the U.S.S.R. standard for aircraft timber.

[924]. 31.27 : 12.26–8. DROW, J. T., and MCBURNEY, R. S. **The elastic properties of wood. Young's moduli, moduli of rigidity, and Poisson's ratios of Yellow Poplar.**

Rep. U.S. For. Prod. Lab., Madison No. 1528–G, 1946. pp. 6 + tbls. + figs. P.R.

Values for the Young's moduli, the moduli of rigidity and the Poisson's ratios of Yellow Poplar at about 11 per cent. moisture content are given. A summary table shows average values for the three Young's moduli and their ratios, the three moduli of rigidity and their ratios of E_L, and the six Poisson's ratios and their ratios to the Young's moduli. Graphs are presented showing the Young's moduli, the moduli of rigidity, and the Poisson's ratios plotted against specific gravity. No close correlation was evident between specific gravity and the elastic constants or their ratios, with the possible exception of Young's modulus parallel to the grain (E_L). Since tests were conducted at only one moisture equilibrium, the effect of moisture content on the elastic constants was not evaluated. *Authors' summary.*

31.3. *Chemical Properties*

[925]. 31.3 : 12.26–8 (675). CASTAGNE, E., ADRIAENS, L., and ISTAS, R. Contribution à l'étude chimique de quelques bois congolais. [**Contribution to the chemical study of some Congo timbers.**] *Publ. Inst. nat. Étude agron. Congo Belge* (*Sér. sci.*) No. 32, 1946. pp. 30. [F.]

Analyses are given of the following timbers: *Chlorophora excelsa, Musanga smithii, Ongokea klaineana, O. gore, Strombosiopsis tetrandra, Annonidium mannii, Beilschmiedia corbisieri, Afrormosia elata, Albizzia ferruginea, A. gummifera, Cynometra mildbraedii, C. harkei, Dialium excelsum, D. corbisieri, Erythrophleum guineense, Macrolobium dewevrei, Pachyelasma tessmannii, Pterocarpus soyauxii, Pterygopodium oxyphyllum, Tessmannia yangambiensis, T. claessensii, Octocosmus africanus, Irvingia grandiflora, Canarium schweinfurthii, Carapa procera, Entandrophragma angolense, E. utile, E. palustre, Guarea thompsoni, G. laurentii, Turraeanthus africana, Uapaca guineensis, Blighia wildemaniana, Garcinia punctata, Mammea africana, Pteleopsis albidiflora, Autranella congolana, Chrysophyllum lacourtianum, Vitex congolensis, Sarcocephalus diderrichii, Mitragyne macrophylla.*

[926]. 31.3. SAVARD, J., LECLERCQ, A., and REYGROBELLET, J. Teneur en cellulose de quelques bois coloniaux. [**Cellulose content of some tropical woods.**] *Agron. trop.* 2 (1/2; 5/6), 1947 (63–8; 310). [F.]

The cellulose content of a number of tropical woods was determined by the Kurschner 1 method, and the results are presented in tabular form. Determinations of crude cellulose content by this method and by the Cross and Bevan method were compared for several species and it was found that the latter method gave consistently higher values owing to the inclusion of a considerable amount of pentosans. It is recommended that comparisons between cellulose content of different woods should always be made on the basis of samples extracted by the same method, or alternatively should be expressed in the form of corrected cellulose content, i.e. crude cellulose content minus the residuary pentosans. The different methods of measuring the pentosans in crude cellulose are sketched in outline.

[927]. 31.3 : 12.26–8 : 33.32.1 : 33.39 : 07.2 (94). **Section of wood chemistry.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 150, 1947 (1–2).

A short account of the work of the wood chemistry section of the C.S.I.R. Division of Forest Products. The chemistry of Eucalypt cellulose and hemicelluloses is now being investigated. Analyses show that Eucalypt woods are richer in xylan than the softwoods. A more recent project deals with the hydrolysis of Eucalypt wood. The adaptation of pulp evaluation methods to the short-fibred Eucalypt pulps has also been achieved.

[928]. 31.3 (44). BERTRAND, G., and BROOKS, G. Sur l'acide acétique combiné dans les bois et les tissus lignifiés. [**On the acetic acid to be found in woods and lignified tissues.**] *C.R. Acad. Sci., Paris* 212, 1941 (739–43). [F.] L.S.

Specimens of wood from 18 tree species indigenous to France and various other vegetable substances were analysed and their acetic-acid content was determined. Results are tabulated. A marked difference was noted in the acetic-acid content of angiosperms and gymnosperms. Trunkwood of angiosperms contained an average of 5·76 per cent. of acetic acid, and branchwood an average of 6·56. Trunkwood of gymnosperms contained an average of 2·06 per cent. of acetic acid, and branchwood 1·98. The possible origin of acetic acid in lignified tissues is discussed.

[929]. 31.3 : 12.25 : 31.42. SOUTHAM, C. M. **Antibiotic activity of extract of Western Red Cedar heartwood.** *Proc. Soc. exp. Biol. Med., N.Y.* 61, 1946 (391–6). [College of Physicians and Surgeons, Columbia University, New York City.] O.R.S.

Water extract of Western Red Cedar (*Thuja plicata*) heartwood has an inhibiting effect on the growth of a wide variety of bacteria and fungi. Inhibition is due to stasis, not to death, of the organisms. The extract does not lose its antibiotic activity when subjected to prolonged boiling or considerable changes in pH. Large doses administered to mice and a rabbit appeared to cause no ill effects.

31.4. *Durability. Decomposition*

31.42. Attack by Plant Organisms

See also *For. Abstr.* 9 (No. 947).

[930]. 31.42.1 : 31.22.1. KOPERIN, F. I. O vliyanii vlazhnosti drevesinȳ na ee porazhaemost' gribami. [**The influence of the moisture content of wood on its susceptibility to fungus attack.**] *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 37–48. [Russ.]

Experiments in which Pine [*Pinus sylvestris*] and Spruce [*Picea abies*] wood were exposed for 4–5 months to infection by *Peniophora gigantea* and *Ceratostomella pini*, gave the following results (moisture contents based on oven-dry weight; results apply to both species of wood except where separately specified):— (1) At moisture contents of 21 per cent. or less neither fungus could develop. (2) In the moisture range 30–70 per cent. *C. pini* developed well, penetrating especially along the rays, but not attacking the heartwood of Pine. In the same range *P. gigantea* grew poorly. (3) At 90 per cent. moisture and higher, *P. gigantea* showed better development; its activity increased with increasing moisture in the wood, e.g. in Pine at 255 per cent. moisture, the wood was infected throughout and decay was visible to the naked eye. (4) In Spruce, moisture contents of 150–190 per cent. limited the development of *C. pini* to the surface layers of the wood. In Pine at moisture contents from 210 per cent. upwards, *C. pini* grew poorly and infected only the surface layers. (5) Bark appeared to offer substantial protection only against infection by spores: fungi developing where the bark was injured or on cut end surfaces, penetrated readily into unbarked wood. The external mycelium of *P. gigantea* grew considerably better on barked wood, whereas its internal mycelium, once given entry, developed better in unbarked wood.

So long as the moisture content is above 21 per cent. other factors must be used to control stain and decay, e.g. leaving bark on logs, treatment with fungicides, and the creation of an unfavourable microclimate in stacks of timber. The test results disagree with the widely held opinion that a moisture content of more than 150 per cent. prevents fungus attack, and cast doubt on Münch's contention that wood containing less than 15 per cent. of air by volume is immune; indeed, *P. gigantea* appears capable of growing and causing decay in almost complete absence of air, and it is inferred that it obtains air from its mycelium on the wood surface.

[931]. 31.42.1 : 12.11.1 : 12.21. ADO, YU. V. Izmenenie kislotnosti sredȳ pod vliyaniem mitseliya gribov. [**Change in the acidity of media under the influence of fungal mycelia.**] *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 49–57. [Russ.]

Starting from Vanin's observation of an increase in the acidity of aqueous extracts of wood undergoing decomposition by fungi, experiments were made on changes in pH during the development of about 30 species of fungi grown on solid flour agar, mineral glucose agar, and wort agar media, with litmus as an indicator. All the fungi used grew well on flour agar, the colour and translucency of which render it specially suitable for colorimetric pH determinations; its combination with litmus enables clear distinctions to be drawn between the behaviour of the different types of fungi.

Under like conditions, the changes in pH of the media depended on the biological characters of the fungi and were correlated with the nature of their action on wood. All wood-rotting fungi acidified the media, whereas blue-stain fungi caused a slight change in the direction of alkalinity. Wood rots of the 'destructive' type (e.g. *Merulius lacrymans*, *Poria vaporaria*, *Lenzites saepiaria*), caused distinct and lasting acidification; those of the 'corrosive' type (e.g. *Trametes pini*, *Peniophora gigantea*, *Polystictus zonatus*), gave slight acidification in the first

few days, but later the media became colourless, indicating the presence of reducing enzymes. Acidification also occurred with the mould *Aspergillus niger* and, more feebly, with *Penicillium* and *Mucor*.

Corticium laeve, *Chaetomium* and others, caused no change. There was no indication that the presence of agar altered the nature of the breakdown of carbohydrates used by the fungi.

The results, together with data from literature on the formation of organic acids by wood-rotting fungi, suggest that acid formation is directly correlated with the ability to decompose cellulose, and in rots of the 'destructive' type there is presumably acid hydrolysis of cellulose, promoted by enzymes from the fungus.

The changes characteristic of the 'corrosive' rots are due to the presence of reducing enzymes, while in the absence of specific enzymes, e.g. in moulds, cellulose decomposition does not occur.

The results are presented in 3 tables.

[932]. 31.42.11 : 12.11.15 : 12.21. LUTZ, M. L. Rôle des ferments solubles au cours des altérations du bois. [**The rôle of soluble enzymes in the course of alterations in wood.**] *Rev. int. Bois* 14 (119), 1947 (99–100). [F.]

A brief review of research done and the present state of knowledge on the soluble enzymes secreted by wood-rotting fungi for the digestion of wood, particularly the hydrolysing and oxidizing enzymes. It is perfectly possible to inhibit the development of a fungus and yet leave these secretions in existence and still active. This fact should be borne in mind when there is a question of stopping an attack already started, and it constitutes an important factor in protection.

[933]. 31.42.11 : 33.8 : 12.21. DAVIDSON, R. W., LOMBARD, F. F., and HIRT, R. R. **Fungi causing decay in wooden boats.** *Mycologia* 39 (3), 1947 (313–27). P.R.

Twenty species of wood-rot fungi were isolated from or collected on specimens of decayed wood in boats, barges, etc. and sporophores of several additional species known to cause decay in wood were collected. The important causes of softwood decay were *Poria microspora*, isolated 23 times; *P. xantha*, 21 times; *P. carbonica*, 7 times; and *Lenzites saepiaria*, 7 times. The more important hardwood fungi were *Poria oleracea*, obtained 12 times; *Daedalea quercina*, 9 times; and *Stereum frustulosum*, 7 times.

The more important hardwood fungi were species that also occur as heart rots in living Oaks. *Poria oleracea* had previously been isolated from heart rot in Oak and is described in this paper as a new species. The more important species in softwood boat timbers are known to be important in decay of buildings and other wood products, but are not known to be important causes of heart rot. *Author's summary.* [Cf. *For. Abstr.* 9 (No. 1170).]

31.43. Attack by Animal Organisms

[934]. 31.43 (213). FISHER, R. C. **Some timber insect problems in utilization in the tropics.** H.M. Forestry Commission, London. 1947. pp. 5. [5th British Empire Forestry Conference, Great Britain, 1947.]

Attention is drawn to some of the more important types of damage caused by wood-boring insects to timber in the tropics and their effect upon closer utilization. The increased exploitation of secondary species and the improved facilities for conversion, drying and storage, are considered possible factors favouring an increase in damage by powder-post beetles. The need is stressed for planned research by trained staff on the biological aspects of the problems as the essential foundation of reliable methods of prevention and control. The loan of trained staff from existing research institutions for work in co-operation with Forest Departments and timber interests, is suggested as a means of initiating investigations on the more pressing problems, under present conditions of shortage of trained entomologists. *Author's summary.*

[935]. 31.43 : 13.2 (485) : 33.4 : 09.4. TRÄGÅRDH, I. **Final survey of the wood-destroying insects in public buildings in Sweden.** *Bull. ent. Res.* 38 (1) 1947 (117–22).

Cf. *For. Abstr.* 2 (303).

Two earlier papers [*Bull. ent. Res.* 29, 1938 (57–62) and *Bull. ent. Res.* 31, 1940 (287–94)] summarized the results of investigations on the borers in public buildings in Götaland and Svealand (S. and C. Sweden). This paper adds

data for Norrland (N. Sweden) and surveys the conditions prevailing in the whole country.

The percentage of damaged buildings is 31 in Norrland, 46·1 in Götaland and 43·8 in Svealand. The two pests most important elsewhere (*Hylotrupes bajulus* and *Anobium striatum*) are very rare in Norrland. *Callidium violaceum* and *Ernobius mollis* are the dominating species. Roof timbers are everywhere attacked more frequently than other parts of buildings.

In Götaland, infestation increases with the increasing age of the building up to 30 years, after which it remains fairly constant, while in Svealand the upper age limit of infestation is 40–70 years. In Norrland the upper limit is 30 years, but the two species most important in this area are not permanent pests, the duration of their attack being limited by the supply of bark under which they live.

[936]. 31.43 : 13.2 (421–8). HICKIN, N. E. **The status of *Hylotrupes bajulus* L. (Col., Cerambycidae) in Surrey.** *Ent. mon. Mag.* 83 (996), 1947 (132).

Eight out of forty records of *Hylotrupes bajulus* in the British Isles relate to Surrey, where sparse coniferous heathland provides a 'wild' environment for the species. The occurrence of an infestation in the structural timber of a house erected about 40 years ago suggests that the insect is an established introduction.

[937]. 31.43 : 13.2 (944). **Wood boring insects of New South Wales. Longicorn beetles. Part 1.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 2 (2), 1947 (1–3).

[938]. 31.43 : 13.2. TACK, G. W. **Is this borer dangerous? Part 1. The Auger Beetle (*Xylion collaris*).** *For. Prod. News Lett. C.S.I.R. Aust.* No. 151, 1947 (3–4).

Xylion collaris is most commonly encountered in scantlings and plaster-sheet or plywood overlays of scantlings in Melbourne. The life cycle can be completed in drying timber, but normal seasoning is enough to render it immune from further attack.

[939]. 31.43 : 13.2. TACK, G. W. **Is this borer dangerous? Part 2. The pinhole borer.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 153, 1947 (2).

[940]. 31.43 : 13.2. CARLE, J. P. Sur une attaque de divers bois par *Dendrolasius fuliginosus* Latr. **[The attack of *Dendrolasius fuliginosus* on various species of wood.]** *Agron. trop.* 2 (5/6), 1947 (303–9). [F.]

Includes a general account of this wood-destroying ant, and a table showing the relative resistance to attack of a number of European and tropical species. The hardest woods are the most, and the softest woods the least resistant.

[941]. 31.43 : 13.2 (729.88). ADAMSON, A. M. **Termites in Trinidad and Tobago, B.W.I.** *Trop. Agriculture, Trin.* 23 (12), 1946 (221–3).

Includes a list of Kalotermitidae and Rhinotermitidae known to occur in Trinidad and Tobago; a brief survey of the nature and extent of termite damage to soil humus, growing crops, stored timber, telegraph poles and fencing, and buildings; and notes on the principal methods of protection.

[942]. 31.43 : 13.2 : 33.36.1 : 12.26–8. ALLIOT, H. Protection du bois d'œuvre contre les termites. **[The protection of timber against termites.]** *Les techniques du bois* 2, 1947 (138–40).

Experiments were made at the Laboratoire de l'Institut National du Bois on the preservation of various colonial timbers against termite attack [cf. *For. Abstr.* 9 (No. 1116)]. The preservatives used in the tests were creosote, pentachlorophenol, DDT, and hexa-chloro-cyclo-hexane. Padouk (*Pterocarpus soyauxii*) absorbs preservatives very easily; Douka (*Mimusops africana*) and Tali (*Erythrophleum guineense*) are very difficult to impregnate. Tests were also made for natural resistance to termite attack. The most resistant species were *Erythrophleum guineense, Lophira procera, Afzelia africana, Mesua ferrea, Tectona grandis*; in the second place came *Afzelia pachyloba, Chlorophora excelsa, Copaifera demeusii* and *C. tessmannii, Fagara macrophylla*, and *Pterocarpus soyauxii*. The following species were particularly susceptible: *Aucoumea klaineana, Entandrophragma spp. Khaya ivorensis, K. anthotheca, Terminalia ivorensis, T. superba, Dipterocarpus* spp.

31.46. Injury by Atmospheric Agencies, Water, etc.

[943]. 31.46 : 07.7. VIRTALA, V. Vollautomatische Bewitterungsanlage nach Virtala für beschleunigte Wetterbeständigkeitsprüfungen. **[Entirely automatic weathering apparatus according to the design of Virtala for accelerated weather-resistance tests.]** *Ber. tech. ForschAnst., Helsinki* No. 11, 1944. pp. 29. [G.] P.R.

A description of a weathering apparatus devised in Finland originally to test the durability of roofing materials. Specimens are subjected to the action of light, circulating air, water and different degrees of temperature, adjusted to represent average weather conditions in Helsinki. The apparatus can be used to test the persistence of fire-proofing agents, the performance of paints and finishes, and the corrosive action of metal etc. on wood, when subjected to open-air conditions.

[944]. 31.46 : 33.53 : 12.25 : 31.27. WAKEFIELD, W. E. **The effect of exposure on strength of Douglas Fir cross-arms.** *Mimeo. For. Prod. Lab., Can.* No. 115, 1946. pp. 14 + figs. P.R.

The report contains data procured from tests of cross-arms of untreated Douglas Fir from Ontario. Sets were made up of new cross-arms and cross-arms removed from line service after periods of 5, 10, 15, 20 and 25 years' exposure. The results presented in graphic form show:—(1) That the greatest rate of strength reduction can be expected during the first 5-year period. (2) That there is a slow but steady decline in strength after 5 years; this becomes very significant after 25 years, when the reduction in load-carrying capacity is approximately 33 per cent.

The test results indicate:—(1) That strength reduction is not due to decay, but rather to the effect of mechanical abrasion of weathered wood from the cross-arm. (2) That weathering is purely a surface effect. *From author's summary.*

31.8. *Quality and Defects of Timber*

See also *For. Abstr.* 9 (No. 1365).

[945]. 31.8 : 31.4 : 32.3 : 4. KNUCHEL, H. Holzfehler. **[Defects of timber.]** Werner Classen Verlag, Zürich. [3rd ed.?], 1947. pp. 119 + plates.

A revised edition with an index, an expanded bibliography and some additional and larger illustrations. [Cf. *For. Abstr.* 7 (No. 1824); 9 (No. 328).]

[946]. 31.8 : 12.25 (68). SCOTT, M. H., and STEPHENS, R. P. **The quality of mature *Pinus patula* and *P. insignis* timber grown in South Africa.** Dept. of Forestry, Pretoria. 1947. pp. 23. [5th British Empire Forestry Conference, Great Britain, 1947.]

Data are presented which enable an accurate comparison to be made of the quality of South-African-grown, mature trees of these two species of Pine with imported Scots Pine, and it is shown that when properly handled the South African timber is quite equal to the imported. Current pruning prescriptions should effect a marked improvement in the quality. *From authors' summary.* [Cf. *For. Abstr.* 9 (No. 920).]

[947]. 31.8 : 12.26–8 : 31.42.1. JACQUIOT, C. Recherches sur le cœur rouge du hêtre. **[Research on red heartwood of Beech.]** *Rev. Bois Appl.* 2 (4), 1947 (8–10, 25). [F.] P.R.

Study of Beech with red heartwood at the 'Laboratoire Central d'Essais des Bois', Paris, and the 'Laboratoire de Biologie végétale de la Sorbonne' at Fontainebleau showed that red heartwood is due to a late formation of tyloses caused by one or several kinds of fungus which exist in the sapwood as harmless parasites, exerting, nevertheless, an influence on the cambium, which causes modifications and a consequent slight loss of strength in the wood. The fungus is also thought to cause the formation of tyloses and a secretion of tannin when the cells die. [Cf. *For. Abstr.* 8 (Nos. 309–10).]

[948]. 31.8 : 31.27 : 31.21.3. POLETIKA, N. V. **Effect of local cross grain on the stiffness of small beams.** *J. For.* 45 (7), 1947 (511–2).

Tests made on a number of small centrally loaded simple beams of Red Oak, Pitch and Shortleaf Pines, and Yellow Poplar, which possessed small areas of local cross-grain, indicated that such beams showed a distinct decrease in stiffness. The basic factors involved appear to be length of cross-grain area relative to span, its average slope, and the position of

the defect in the span, the last-mentioned being the most important. The influence of cross-grain on stiffness is of particular importance in determining the modulus of elasticity of second-growth timber.

32. HARVESTING OF WOOD. LOGGING

[949]. 32 : 07.7. BOHL and BADRE. L'utilisation des moyens mécaniques pour l'exploitation et le débardage des produits forestiers. **[The use of mechanical methods for the exploitation and transport of forest products.]** *Les techniques du bois* 1, 1947 (20–2). [F.]

A report on the use of various mechanical devices during the rehabilitation of the war-damaged forests of Alsace. Three types of portable chain saw for use in the woods are compared—the American Mercury, the German Dolmar, and the French Quick. The Dolmar needs a crew of three men, who relieve each other every 15 minutes, since the motor end of the saw is the heavier and more fatiguing. Production with this saw is estimated at 15–20 cu.m. in 8 hours compared with 3–4 cu.m. by 2 men working by hand. Notes are given on the performance and consumption of fuel of several military vehicles used for clearance and transport of forest products, i.e. the 60-h.p., caterpillar R.4; the English caterpillar tractor T.16, Ford V.8; the half-track, a 17-ton caterpillar tractor; and the G.M.C. type CCKW, series 352, 17-h.p. lorry.

[950]. 32 : 07.7 (76). LOCKARD, C. R. **Foresters view timber harvesting machinery.** *Sth. Lumberm.* 174 (2189), 1947 (72, 74, 76–7). [Southern Forest Experiment Station.]

Notes on and photographs of timber-harvesting machines exhibited to a conference of members of the Gulf States and South-eastern sections of the Society of American Foresters.

[951]. 32 : 33.02 : 33.17. BOWER, R. F. **Improved methods of harvesting pulpwood.** *J. For.* 45 (7), 1947 (478–82).

Analyses the organization, manning and costs of a fully mechanized pulpwood operation using power saws for felling, mechanical skidding and loading, and portable sawmills. Particular attention is given to the routine servicing and inspection of trucks. It is concluded that mechanical harvesting can compete economically with the usual small private producer on large tracts of pulpwood forest.

32.2. *Felling and Related Operations*

[952]. 32.25 : 07.7. KHARLAMOV, N. F., and MAKOVEEV, P. D. Elektropilў i peredvizhnўe elektrostantsii povўshennoy chastotў. **[Power saws and mobile high-frequency power units.]** *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946 (113–28). [Russ.]

Three models of Kharlamov's one-man power-saw [see *For. Abstr.* 8 (No. 324)], differing in the electric motors used, have been designed, but of these only one is considered light enough (7 kg.) for one man to handle. This saw, with a 3-phase A.C. (175 cycles) motor, is described in detail, with notes on its performance, in the first half of the present paper. It has not yet been mass-produced owing to the lack of a suitable generator unit. The second half of the paper deals with the construction (diagram) and specifications of an experimental mobile power unit consisting of a high-frequency generator giving 5 KW at a normal speed of 2,620 rev./min. and weighing 63 kg. together with the energizer (a D.C. dynamo of a type used in tractors). This unit requires a high-speed engine (not less than 2,200 revs./min.) of 7–8 h.p. The two-stroke, two-cylinder, 11–12 h.p. motor used experimentally gave excessive vibration and high petrol consumption, and it is recommended that a four-stroke, two-cylinder, 12 h.p. engine be substituted. This would bring the total weight of the aggregate to 220–250 kg. Such a unit would supply power for 2–3 saws working simultaneously and would be light enough for use on felling sites the year round.

[953]. 32.25.2 (672). NOYON, H. L'abatage des arbres en forêt du Gabon. **[The felling of trees in the forests of Gabon.]** *Bois For. Trop.* 1 (1), 1947 (31–3). [F.]

The trees of Gabon are for the most part buttressed to a height of 1–2 m. above the ground, and the fellers have to work from platforms. The usual tool is an American-type axe weighing 1·8–2 kg., with a curved handle. Much loss is caused by unskilful preparation of notches, and the article is mainly concerned with instructions for doing this properly.

[954]. 32.25.4 : 07.7. **Timber bucking chute.** *Timberman* 48 (10), 1947 (36, 50 + plates).

Description of a central crosscutting installation developed by a Washington lumber firm in order to reduce costs of crosscutting. Logs are topped and limbed in the woods and brought to the centre by skidding tractors. The 156-ft.-long chute is built on skids and divided into sections for easy assembly. The electrically operated 7-ft. chain saw equipped with a Titan chain averages 175,000 bd. ft. per day.

[955]. 32.29 : 07.7 : 32.9. RICHEN, C. W. **Some problems in relogging of cutover lands.** *Pulp Paper Ind.* 20 (2), 1946 (58,60).

An account of methods at present in use for recovery of logging waste in Oregon, including bundling, weighing instead of scaling, and rafting. The need for specialized equipment is stressed.

32.3. *Sorting*

See also *For. Abstr.* 9 (No. 962).

[956]. 32.3 : 33.53. MILLER, R. H. P., and FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Sorting platform.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–12, 1947. pp. [1]. P.R.

Poles to be sorted are rolled across skids to a platform which has rollers built into it to facilitate skidding. Skids at right angles to the platform, placed at various intervals, provide the base for storage decks. The roadway at the outer end of the skids is low enough to allow gravity loading of conveyances.

32.7. *Loss in Logging. Incidental Waste*

See also *For. Abstr.* 9 (Nos. 1098–9, 1105–7, 1137–8).

[957]. 32.7 : 33.02 : 52.43.2. GEVORKIANTZ, S. R. **Pulpwood volume increased by closer utilization.** *J. For.* 45 (7), 1947 (511).

A table showing the additional volume of pulpwood produced when utilization is changed from a 4-in. to a 3-in. top diameter inside bark. It applies to all pulpwood species in the Lake States.

32.8. *Grading and Storage of Wood in the Rough*

See also *For. Abstr.* 9 (Nos. 930, 1113).

[958]. 32.81 : 33.15.1 : 12.25 (931). **[Grading veneer logs.]** *Rep. N.Z. For. Serv. 1945–6*, 1946 (40).

Recommendations are made for specifications for peeler logs of Rimu (*Dacrydium cupressinum*), Matai (*Podocarpus spicatus*), and Miro (*Podocarpus ferrugineus*). Four inches off centre for logs under 6 ft. girth and 5 in. for larger logs is recommended as a permissible maximum excentricity. Spiral grain is a serious defect likely to give poor conversion and cause warping in the finished plywood. Nine inches in 6 ft. 6 in. should be the permissible maximum. Percentage conversion of green timber to green usable veneer was shown to be 60 per cent. for 'select' quality logs compared with 47 per cent. for lower-quality peeler logs.

[959]. 32.82 : 33.53 : 12.25 (931) : 32.25.5 : 33.36. **[Effect of storage in bark on treatment and seasoning of Larch posts.]** *Rep. N.Z. For. Serv. 1945–6*, 1946 (38–9).

It was found that retention of bark for 1, 2 or 3 months before treatment had no significant influence on the absorption or penetration of creosote. No significant drying occurred until the bark was removed. There was no difference in the rate of seasoning of posts barked immediately after cutting and posts on which the bark had been retained for 1–3 months after cutting. The rate of seasoning down to the fibre saturation point varied only slightly with the month of cutting.

32.9. *Transport*

See also *For. Abstr.* 9 (Nos. 949–51, 956, 1241).

[960]. 32.9 : 07.7. ETIENNE. L'organisation des exploitations forestières du point de vue du transport des bois. **[The organization of forest exploitation from the point of view of transport of wood.]** *Les techniques du bois* 1, 1947 (28–33). [F.]

General considerations on various types of transport, with notes on particular tractors, trucks, trailers, skidding wheels, skidding shoes, cableways, cranes and derricks.

[961]. 32.92–4 : 07.7. **Grapple-equipped crane transfers pulpwood from river bank**

into stream. *Paper Ind.* 29 (3), 1947 (372). P.R.

A new method of moving pulpwood from a river bank or shore of a lake is provided by a boom-equipped crawler crane-and-grapple combination. The crane is mobile, and a 25-ft. boom makes it possible to drop the wood 30 or more feet from the point of picking up.

[962]. 32.92 : 32.3. **Pulpwood sorting on the St. Maurice.** *Pulp Paper Mag. Can.* 48 (7), 1947 (76–8).

Account of a device for sorting and holding back 4-ft. logs from 8- to 16-ft. logs driven together down a tributary of the St. Laurence. The logs are passed over a pontoon-mounted log conveyor measuring 60 ft. long by 20 ft. wide. Beyond the head shaft of the conveyor is a 25-ft. 'live' or power-operated roller which has a considerably greater peripheral speed than the speed of the conveyor chains. The gap between conveyor head shaft and live roller allows 4-ft. logs to fall through, while the 8- to 16-ft. logs are carried across the gap and bounce off. Long logs coming up crosswise occasionally drop through, but can, by means of partitions, be discharged into the clear water in front. About 1 per cent. of 4-ft. logs are carried across the gap with the longer logs, but this happens only when they are resting on top of an exceptionally heavy load.

[963]. 32.95 (44). PONCET, A. L'emploi des câbles en acier dans la vidange des produits forestiers. **[The use of steel cables in harvesting forest products.]** *Rev. Bois Appl.* 1 (12), 1946 (16–20). [F.] P.R.

Cf. *For. Abstr.* 8 (No. 2485), for first part of this article.

[964]. 32.95 : 07.7. Le téléphérique Wyssen : un nouveau moyen de transport pour la vidange des forêts en montagne. **[The Wyssen cableway: a new method of transport for clearance of mountain forests.]** *Les techniques du bois* 1, 1947 (34–5). [F.]

Cf. *For. Abstr.* 8 (No. 1874).

[965]. 32.95 : 07.7. BOHL and HATT. Installation d'un Lasso-Câble en forêt domaniale de la Hardt. **[Installation of a 'Lasso-Câble' in the state forest of La Hardt.]** *Les techniques du bois* 1, 1947 (23–5). [F.]

The 'Lasso-Câble' is a Swiss patent cableway, manufactured by the Bureau Technique St. Alban at Bâle. It is generally used in Switzerland for the transport of firewood in 3-ft. lengths on mountain sites not easily accessible by road. Details are given of the equipment and its installation and cost, the weekly consumption of fuel and the output, in an installation in the Hardt forest on the Hunigue Canal, which was used for loading wood directly into barges. It is estimated that the saving effected was 70–80 francs per stere and that the installation would pay for itself after 1–1½ years.

[966]. 32.95 : 07.7. MILLER, R. H. P., and FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Portable spars.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–13, 1947. p. [1] + figs. P.R.

Three types of portable spars are described and illustrated:—(1) timber A-frame, (2) hollow steel poles, and (3) fabricated steel tower.

[967]. 32.96 : 07.7. MILLER, R. H. P., and FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Hydraulic clutch for truck winches.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–8, 1947. p. [1] + figs. P.R.

A short description of a hydraulic clutch for a truck winch, which can be operated by the driver from outside the truck cab, where he has a full view of loading operations.

[968]. 32.96 : 07.7. MILLER, R. H. P., and FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Safety trip stake.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–10, 1947. p. [1]. P.R.

The stakes described are released from the opposite side of the truck and thus eliminate danger in unloading. They are held in place by a combination of cable and chain—an improvement on chains alone, which are liable to catch.

[969]. 32.96 : 32.91. TUCKER, J. W., JR., and MCCLURD, J. M. **Timber, the key to Southern industrial expansion.** *Paper Ind.* 29 (3), 1947 (434, 436). P.R.

A system of pulpwood handling developed by the Tidewater Equipment Company, Brunswick, Georgia, comprises:—(1) skidding the logs from stump to a central loading point; (2) bringing them to a deck where they are

cut into pulpwood lengths and loaded directly on tubular pallets. The pallet assembly is known as the 'Dixie Skid Loader'; (3) self-loading of the pallets by a truck—a matter of minutes. By this method trucks are not delayed in the woods for loading. They always carry a uniform load and two handlings of the wood are eliminated.

[970]. 32.96 : 07.7. MILLER, R. H. P., and FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Pre-loading detachable truck body.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–9, 1947. p. [1] + figs. P.R.

Tractors with sulkies pass over a divided ramp and logs are lowered between the ramp tracks to a detachable truck body. When loaded, the truck body is transferred sideways off the ramp bunks to the track bunks with power-driven transfer chains.

[971]. 32.96 : 07.7 : 32.91.22. MILLER, R. H. P., and FOBES, E. W. **Improved harvesting methods. Equipment survey notes. End-loading semi-trailer.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–6, 1947. p. [1] + figs. P.R.

A description of a trailer developed by a Californian logging company in co-operation with the Forest Service (630 Sansome Street, San Francisco 11). It consists of a short-wheel-base truck and pole trailer with tandem wheels. A winch is installed behind the truck cab. Hollow tubular steel arches are built up over the bunks on the trailer and the truck. A cable block is attached to the apex of the forward arch, and a snatch block to the rear arch. When logs are loaded, the front end of the log can be raised by means of the cable over the rear bunk.

[972]. 32.96 : 32.91.4. OWENS, E. B. **Loading logs for rail shipment.** *Timberman* 48 (9), 1947 (42, 43, 46, 68, 70–1).

The basic principles for loading sawlogs on railway trucks, as practised on the Northern Pacific Railway Co., Washington.

33. CONVERSION AND PRESERVATION OF WOOD

[973]. 33 : 2. COX, H. A. **Modern trends in timber utilisation.** H.M. Forestry Commission, London. 1947. pp. 4. [5th British Empire Forestry Conference, Great Britain, 1947.]

An outline of the ways in which recent developments in timber utilization (plywood, pulp, plastics, improved woods) have influenced and are likely to influence the practice of forestry.

[974]. 33 (71) : 34.6 : 32.7. MCELHANNY, T. A. **Conservation by better utilization.** Dominion Forest Service, Ottawa. 1947. pp. 24. [5th British Empire Forestry Conference, Great Britain, 1947.]

Stresses the necessity for better utilization of the material which is annually harvested from the forest, and points out the value of research in improving utilization. The methods of accomplishing this, and the data cited, refer primarily to Canada, though many have much wider application. Estimates are presented showing the annual over-all volume of wood waste in the woods, logging camps, mills, and factories of Canada. [Cf. *For. Abstr.* 9 (Nos. 955, 957, 981).]

[975]. 33 : 32.3. **Report of the committee on forest products research: appendix on the grouping of secondary timbers.** In *Fifth British Empire Forestry Conference, Great Britain, 1947: Summary Report.* 1947 (49–50). H.M. Stationery Office, London.

As a general rule the composition of mixed tropical hardwood forests is such that it is impracticable to utilize more than a small proportion of the secondary species separately, each under its own name. A partial solution of the problem is to classify secondaries in broad groups or classes according to their appearance, properties and potential uses, having regard to the fact that the great bulk of timber (as distinct from firewood) is required for purposes such as railway sleepers, house-building, flooring, plywood, boxes and crates, joinery and furniture. This grouping of species has operated in Malaya and, in a modified form, in Australia, South Africa and other countries, for some time. For each of the above-mentioned purposes the forests can provide a number of more or less similar timbers capable of being utilized, separately or together, for the same class of work. The more important factors to be taken into account in assigning a timber to its appropriate utility class are density, strength properties, appearance,

durability and amenability to preservative treatment, working properties and liability to major defects. Comparatively few timbers have been subjected to systematic test and it will be only a small proportion for which the technical data under these heads are reasonably complete and accurate, but a provisional classification of the better known secondaries can be made on the basis of existing knowledge pending their further investigation.

33.0. *Utilization Categories of Wood*

[976]. 33.0 : 12.26–8 : 32.25.5 : 34.24 : 33.38.2. VIBRAYE, L. DE. Exploitation et utilisation rationelles des rondins de chêne provenant de coupes de taillis ou d'éclaircies. [**Rational exploitation and utilization of Oak billets obtained from coppice or thinnings.**] *Les techniques du bois* 1, 1947 (104–5). [F.]

A suggested scheme for barking small-dimensioned Oak in the woods by means of steam, and drying the barked wood for use in gas-producer engines. It is calculated that 17 steres of Oak billets will produce one ton of tanbark and 4·7 tons of gas-producer fuel.

[977]. 33.0 : 32.7 : 33.7 : 34.6. KNUCHEL, H. Utilisation future des assortiments feuillus de faibles dimensions comme combustible. [**Future utilization of hardwood assortments of small dimensions as fuel.**] *Les techniques du bois* 3, 1947 (100–2). [F.]

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

[978]. 33.1 : 43.1. WEST, G. A. V. **Fire protection in sawmills, workshops and timber yards.** *Timber News* 55 (2092; 2094), 1947 (68–9, 76; 131–2). P.R.

Use of Wastes

See also *For. Abstr.* 9 (Nos. 1098–1100, 1105–6, 1149–50).

[979]. 33.1 : 34.6. **Uses for sawdust and shavings.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–1, [*n.d.*] pp. 3 + tbls. P.R.

[980]. 33.1 : 34.6. **Uses for slabs, edgings, and trims.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–2, 1947. pp.2 + tbls. P.R.

Uses for sawmill and factory waste are tabulated in four sections: typical sawn products, fuel products, fibre products and chemical products.

[981]. 33.1 : 34.6 (71). PRINCE, J. B., and BELL, G. E. **A review of logging and sawmilling waste studies in Canada.** *B.C. Lumberm.* 31 (5), 1947 (46–7, 54–6). Also in *Timber of Canada* 7 (10), 1947 (49–51, 64–70).
Cf. *For. Abstr.* 9 (No. 974).

[982]. 33.1 : 34.6 : 07.7. SALOMON, R. Captation et transport pneumatique des sciures et copeaux. [**The pneumatic collection and transport of sawdust and shavings.**] *Rev. Bois Appl.* 2 (4), 1947 (21–5). [F.] P.R.

[983]. 33.1 : 34.6. **Sawdust-cement concrete.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–15, [*n.d.*] pp. 5. P.R.

[984]. 33.1 : 34.6 : 33.16 : 12.25. **Wood flour from waste matchwood.** *Timberman* 48 (8), 1947 (70, 72).

Match block shavings of Idaho White Pine, formerly burned as waste or sold as fuel, are being used in a Washington wood-flour plant to produce a wood flour of light consistency and good colour.

[985]. 33.1 : 34.6 : 33.7. GUILLON, H. Utilisation des déchets de bois comme combustibles: combustibles coloniaux. [**The utilization of wood waste as fuel: colonial fuels.**] *Les techniques du bois* 3, 1947 (103–6). [F.]

[986]. 33.1 : 34.6 : 33.7 : 07.7. HARRIS, P. **The utilization of wood waste as fuel.** Forest Products Research Laboratory, Princes Risborough. 1946. pp. 8. P.R.
Cf. *For. Abstr.* 5 (272).

[987]. 33.1 : 34.6 : 07.7. MILLER, R. H. P. **Small sawmill improvement. Practical pointers to field agencies. Burning waste material at small plants remanufacturing wood products.** *Rep. U.S. For. Prod. Lab., Madison R*899–25, 1946. pp. [1] + fig. P.R.

An illustrated description of a Dutch-oven type of refuse burner suitable for wood remanufacturing plants in cities. This gives

more complete combustion than the common type used by small sawmills and has a stack which carries the smoke higher.

[988]. 33.1 : 34.6 : 33.7 : 07.7. Le briquetage des sciures. [**Briquetting sawdust.**] *Rev. Bois Appl.* 1 (12), 1946 (34–5). [F.] P.R.

A description, with illustrations, of a Swiss machine for making briquettes from sawdust, shavings and charcoal dust. The machine can produce 8 tons of briquettes in 8 hours with 6 to 8 workers.

[989]. 33.1 : 34.6 : 33.39 : 12.25. BERGEN, E. Étude sur l'utilisation intégrale et rationnelle des déchets du pin des Landes. [**Study on the complete and rational utilization of waste wood from the Pines of the Landes.**] *Les techniques du bois* 3, 1947 (23–5). [F.]

The writer describes processes used at the factory of the Société Bois et Dérivés at Anglet (Basses-Pyrénées) for the utilization of sawdust. This is first reduced to wood flour, from which the 'vasculose' (i.e. the residue of terpenes, carbohydrates, resins, tars, etc.) is then separated by centrifugal force. 'Vasculose' is a valuable cleansing agent and greatly improves the detergent properties of soap. Notes are also given on the 6 types of cellulose produced at this factory.

33.10. Hand Sawing

[990]. 33.10. EDWARDS, E. J. K. **Pit-sawing.** *Bull. Minist. Agric. Lds., S. Rhod.* No. 1381, 1947. pp. 4 + figs. *Repr.* from *Rhod. agric. J.* 44 (1), 1947 (6–8). P.R.

33.12. Joinery, Turnery

[991]. 33.12 : 07.7. DESLANDES, F. Études sur les machines à bois; machines á défoncer. [**Studies on woodworking tools; recessing-machines.**] *Rev. Bois Appl.* 2 (4), 1947 (15–20). [F.] P.R.

[992]. 33.12 : 07.7. HAYCOCK, A. H. **Special routing machines.** *Wood* 12 (4), 1947 (115–8).

[993]. 33.12 : 33.15.2. PATRONSKY, L. A. **All veneer furniture—a new construction method.** *Veneers & Plyw.* 40 (9), 1946 (12, 14). P.R.

Research at the Wood Technology Laboratory of Michigan University is exploring the best commercial methods of making moulded plywood furniture. A V-slotting method of bending plywood was found to be an improvement on the traditional saw-kerfing method, which leaves a wedge-shaped opening through which moisture may enter.

33.14. Match Manufacture

See also *For. Abstr.* 9 (No. 1003).

[994]. 33.14 (44). ARGUILLÈRE, J. La fabrication des allumettes. [**Match manufacture.**] *France tech.* No. 2, [1946?] (37–8). [F.] P.R.

33.15. Manufacture and Use of Veneers and Laminated Woods. Improved Woods. Laminated Materials other than Wood. Glues and Gluing

[995]. 33.15 (431–5) : 33.32.3 : 34.6 : 33.32.1 : 33.32.4. LOVE, T., HOFTON, J., MESSENT, S. W., and DAVIES, D. N. **Investigation of German plastics plants. Part V. Thermosetting resins.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 1065, Item No. 22, 1946. pp. 195 + tbl. P.R.

Investigations on thermosetting resin glues for wood included phenolic glues made by Bakelite G.m.b.H., Tegofilm made by Theodor Goldschmidt A.G., Schöppenstedt, and urea-formaldehyde resins made by I.G. Ludwigshafen-Oppau. Formulae, methods of manufacture and properties are given.

Attempts were made by I.G. Wolfen, Resart Gesellschaft, Mainz and Dynamit A.G. in collaboration to save phenol and formaldehyde by using lignin in moulding materials. A resin made from phenol and Scholler lignin was used either with formaldehyde or alone with a wood-flour filler. Mouldings obtained were not good, but better than the low-resin-content material used by the Germans later in the war. Translations of some reports on experiments in manufacture and on the properties of the product are included; also details of a wood-chip board bound with a phenol-formaldehyde type of resin made by Homogenholzwerke Baiersbronn.

'Lignidur', a wood-veneer compound used to make bearings and gear wheels was made by International Galalith G.m.b.H., Harburg—Hamburg. Veneers were cut into pieces approximately $1 \times \frac{3}{4}$ in., impregnated with a water-soluble resin, dried and pressed into sheets.

[996]. 33.15 : 31.27. MARCH, H. W., and SMITH, C. B. **Buckling loads of flat sandwich panels in compression. Various types of edge conditions.** *Mimeo U.S. For. Prod. Lab., Madison* No. 1525, 1945. pp. 10 + figs. P.R.

Formulae and curves are given for determining the approximate buckling loads of sandwich panels under the following types of edge conditions: (1) all edges simply supported; (2) loaded edges simply supported and the remaining edges clamped; (3) loaded edges clamped and the remaining edges simply supported; (4) all edges clamped.

[997.] 33.15 : 31.27. BOLLER, K. H. **Buckling loads of flat sandwich panels in compression. The buckling of flat sandwich panels with edges simply supported. (End grain Balsa cores and facings of aluminium and glass cloth laminate.)** *Rep. U.S. For. Prod. Lab., Madison* No. 1525–A, 1947. pp. 26 + tbls. + figs. P.R.

Gives the results of tests for the determination of the critical buckling loads of flat sandwich panels, with all edges simply supported, subjected to edgewise compression. The tests were conducted to confirm the theoretical analysis given in a previous report [cf. previous abstract]. *From author's summary.*

[998]. 33.15 : 31.27. KUENZI, E. W. **Design criteria for long curved panels of sandwich construction in axial compression.** *Rep. U.S. For. Prod. Lab., Madison* No. 1558, 1946. pp. 20 + tbls. + figs. P.R.

An investigation was conducted at the Forest Products Laboratory, Madison, to establish design criteria for curved plates of sandwich construction under axially compressive loads. The axial buckling strength of a well-made, long, curved plate of sandwich material may be computed by adding the critical stress of a complete cylinder, of which the plate may be considered a part, to the critical stress of a flat plate having the same dimensions as the curved plate. The stress at which crimping of the entire sandwich will occur is equal to or greater than the computed critical stress, provided there are no structural defects. The analysis presented includes methods of calculating the critical stresses when the facings are stressed beyond the proportional limit. *Author's summary.*

[999]. 33.15 : 32.27. **Tentative methods for conducting mechanical tests of sandwich constructions.** *Rep. U.S. For. Prod. Lab., Madison* No. 1556, 1946. pp. 5 + figs. P.R.

[1000]. 33.15 : 31.27 : 33.8. **Tentative methods of test for determining strength properties of core material for sandwich construction.** *Rep. U.S. For. Prod. Lab., Madison* No. 1555, 1946. pp. 15 + figs. P.R.

[1001]. 33.15 : 31.27 : 31.4 : 33.32.3 : 12.26–8. MACKIN, G. E., KINGSBURY, R. M., BAIRD, P. K., ERICKSON, E. C. O., and MOSES, C. S. **Resin-treated pulp board core material for sandwich constructions, with appendix by C. S. Moses on decay resistance of Balsa and pulp board core materials.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1623, 1947. pp. 18 + tbls. + figs. P.R.

Methods of impregnating, drying and curing pulpboard for core materials in sandwich constructions were studied at the Forest Products Laboratory, Madison. The effect of variations in these methods, concentration and type of resin solution, resin content, curing temperature and of variations in the composition and structure of the board itself on the strength and durability of the core material were tested. The results are given in detail.

Highest-strength core materials in the 0·10 to 0·20 specific gravity range were those prepared from uniformly impregnated pulpboards which contained a wide range of coarse and fine groundwood fibres and 40 to 50 per cent. of an oil-modified phenol resin. This type of core material resisted weathering and attack by decay organisms to a much higher degree than did Balsa wood. Flatwise compressive and tensile strengths of the pulpboard were below the revised requirements for wood aircraft structures set up by the U.S. AAF Material Command in 1944.

An appendix describes tests to estimate the comparative decay resistance of Balsa and impregnated pulpboard. The values obtained

show that the pulpboard is several times as resistant to decay as Balsa, but that attack varied greatly with the type of fungus. Edge-treated specimens showed a greater loss in weight than other specimens. No explanation for this phenomenon was found.

33.15.1 *Manufacture of Veneers and Laminated Wood*

See also *For. Abstr.* 9 (No. 958).

[1002]. 33.15.1 (52) : 09.4. HAIBACH, D. J. **Veneer and plywood manufacturing in Japan (preliminary report).** *Rep. Brit. Intell. Obj. Sub-comm.* No. BIOS/JAP/PR/741, 1946. pp. 55. P.R.

An appreciation of the present situation in the Japanese plywood industry is given. Production has declined from 830,000,000 sq. ft. in 1940 to 95,000,000 sq. ft. in 1945. Present production, impeded by labour and transport difficulties, machinery and glue shortages is 2,000,000 sq. ft. monthly. Methods of manufacture and equipment are described and illustrated, and plywood and veneer grading rules drawn up by the Federation of Japan Plywood Manufacturers' Association are given. The report includes a list of plywood and veneer and glue factories with figures for production and export capacity, price lists, and a list of species used.

[1003]. 33.15.1 : 12.25 : 13.14 : 33.8. GORDON, A. **Investigations on Klinki Pine from New Guinea.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 150, 1947 (3–4).

Experiments were made by the C.S.I.R. Division of Forest Products with wood from a log of Klinki Pine from New Guinea. Satisfactory veneers were made and were dried and glued successfully. Matches of good quality were also made. Investigations are being carried out to find whether the veneer is suitable for battery separators.

[1004]. 33.15.1. LYON, M. J., AGET, E., LOUCHARD, M., and GOUILLOTEL, G. **Improvements in and relating to the making of plywood and like articles.** *Brit. Patent* No. 582,478, Nov. 18, 1946. *Timber News* 55 (2094), 1947 (148).

Methods of cutting, laying up and pressing packs of veneer to form angle-shaped plywood members are described. Various bent and die-pressed forms are specifically mentioned; among these are U-section channel members, flanged rings and moulded aircraft parts.

[1005]. 33.15.1 : 33.4 : 33.15.5 : 31.27. MORRISON, C. F., KENNEDY, D. E., and BERGIN, E. **Strength tests on glued laminated beams.** *Mimeo. For. Prod. Lab., Can.* No. 113, 1946. pp. 13 + figs. P.R.

Tests on laminated beams were carried out at the Forest Products Laboratory, Ottawa, to determine the suitability of various surfaces for gluing, the most efficient methods of fabricating, assembling and applying gluing pressures, and the efficiency of various beam sections. Tests on various small specimens and on thirty 15-ft. beams led to the following conclusions:—(1) The best glue joints are formed by planed to planed surfaces. (2) When nails are used to provide gluing pressure the length of each nail should be at least 2½ times and slightly less than 3 times the thickness of each lamination. (3) Clamping is in general the most effective means of assembly. (4) Scarfed joints are preferable to butt joints. (5) Butt joints should not be used in the 2 top and 2 bottom laminations of beams containing 8 laminations. (6) I-beams may be more efficient than rectangular beams under certain conditions. (7) Spruce beams with Douglas Fir laminations at top and bottom may prove an efficient combination. (8) When clamping is used for gluing, pressure per sq. in. of glue line should be approximately 100 lb. multiplied by the thickness of the lamination in inches.

Detailed results of the tests are given. [Cf. *For. Abstr.* 9 (No. 1016–7).]

[1006]. 33.15.1 : 33.8. HENDERSON, J. **Method of manufacturing laminated articles from veneer or like sheet material.** *Brit. Patent* No. 554, 626, July 13th, 1943. pp. 4 + figs. P.R.

A method of manufacturing hollow articles, such as boxes, wardrobes and cabinets, by moulding the disunited veneers upon a former, with an outer wrapping in the form of a flexible, metallic sheet. The veneers are previously coated with a suitable adhesive—either hot or cold—and pressure is applied until the adhesive sets.

[1007]. 33.15.1 : 33.8. KRÉMER, H. Perfectionnement à la fabrication des tubes en bois à couches superposées. [**Improvement in the fabrication of wooden laminated tubes.**] *Fr. Patent* G.7. Cl. 1, No. 914,838, Oct. 18th, 1946. *Rev. Bois Appl.* 2 (4), 1947 (35). P.R.

A method of making wooden tubes in which successive layers of veneer, impregnated with a thermosetting resin, are wound round a cylindrical hollow mould. The veneers are then subjected to heat in order to set the resin, steam being introduced for this purpose into the hollow of the mould.

[1008]. 33.15.1 : 33.8. GOLDMAN, P. R., and ALT, R. (to Plymold Corp.) **Wood tubing.** *U.S.Patent* No. 3,402,038, June 11th, 1946. *Mod. Plastics* 24 (2), 1946 (170). P.R.

Wood veneer tubing is prepared by wrapping a continuous veneer strip spirally into an elongated, closed, straight, tubular form and continually advancing it along a work path. A second strip is wrapped spirally in the opposite direction about the first. A layer of polymerizable bonding agent is applied between the two layers and heat and pressure are applied at each individual wrap.

[1009]. 33.15.1 : 33.32.4. DARLING, W. B. **Paper plastics surfacing.** *Mod. Plastics* 24 (2), 1946 (97–100). P.R.

Resin-impregnated paper can be used for surfacing plywood. An opaque surfacing may be procured by bonding resin-coated paper, or paper impregnated with a small amount of resin, to the core by means of an additional glue line. A transparent coating can be obtained by using paper with a resin content in the range of 55 per cent. which will be self-bonding. This can be rendered opaque, if desired, by the use of a pigment. A pressure of 100 to 200 lb./sq. in. is necessary for an opaque, and a minimum pressure of 250 lb./sq. in. for a transparent surface. For phenolic resins, a curing temperature of 300 to 310° F. should be maintained. For melamine resins a temperature of between 270 and 300° F. is necessary. The binder used in the core material should be of a kind which will not break down under the temperatures necessary for curing the paper. The use of cauls and cushioning in pressing is discussed.

33.15.2. *Use of Plywood and other Laminated Wood*

See also *For. Abstr.* 9 (No. 993, 1168, 1171, 1173, 1236).

[1010]. 33.15.2 : 31.27. FREAS, A. D. **Methods of computing the strength and stiffness of plywood strips in bending.** *Mimeo U.S. For. Prod. Lab., Madison* No. 1304 (rev.), 1946. pp. 10 + figs. P.R.

[1011]. 33.15.2 : 31.27. **Methods of conducting buckling tests of plywood panels in compression.** *Rep. U.S. For. Prod. Lab., Madison* No. 1554, 1946. pp. 8 + figs. P.R.

[1012]. 33.15.2 : 31.27 : 33.15.5. WAKEFIELD, W. E. **The tension normal to glue line plywood test.** *Mimeo. For. Prod. Lab., Can.* 121 (rev.), 1947. pp. 7 + figs. P.R.

Cf. *For. Abstr.* 7 (No. 1285).

[1013]. 33.15.2 : 31.27. HEEBINK, T. B., MARCH, H. W., and NORRIS, C. B. **Buckling of stiffened, flat, plywood plates in compression. A single stiffener perpendicular to stress.** *Rep. U.S. For. Prod. Lab., Madison* No. 1553, 1946. pp. 18 + tbls. + figs. P.R.

A mathematical analysis of the critical stress of a plywood plate in edge compression stiffened by means of a stiffener glued to the plate is presented in this report. The analysis yields an approximate formula for the minimum stiffness of the stiffener required to cause the plate to buckle into two half-waves rather than into one. The data from 371 tests of 60 plates suggest a modification of the formula by an empirical factor, probably made necessary by the original lack of flatness of the plates. [Cf. *For. Abstr.* 9 (No. 365).] *Authors' summary.*

[1014]. 33.15.2 : 31.27. HEEBINK, T. B., and NORRIS, C. B. **Supplement to buckling of stiffened, flat, plywood plates in compression. A single stiffener perpendicular to stress; face grain of plywood at 45° to its edges.** *Rep. U.S. For. Prod. Lab., Madison* No. 1553–A, 1946. pp. 9 + tbls. + figs. P.R.

This report gives the results of tests performed on flat plywood plates, stiffened with single, horizontal stiffeners, and loaded vertically in edgewise compression, with the stress applied at 45° to the direction of the grain of the face plies. An approximate formula for

the critical stiffness of the stiffeners is presented, which was obtained from data on 74 tests of 9 stiffened plates. The development of the formula makes use of several assumptions; it is believed, however, that the assumptions are reasonable and that the formula safely applies to plates of any practical dimensions. *Authors' summary.*

[1015]. 33.15.2 : 33.15.4. **New qualities added to low-cost plywood.** *Mod. Ind.* 13 (5), 1947 (141–2). P.R.

'K-Veneer' manufactured by Elmendorf Corp., Chicago, consists of a single layer of low-grade plywood used as a base for felt or aluminium. The plywood may be of Hemlock or other cheap woods usually considered unsuitable, and is split to give freedom for internal expansion after fabrication and to prevent warping.

[1016]. 33.15.2 : 38.2. CAMPREDON, J. L'utilisation de la colle dans la charpente. [**The use of glue in wooden frameworks.**] *Circ. Inst. tech. Bâtim. Trav. publ., Paris (Sér. H.)* No. 20, 1947. pp. 16. [F.] P.R.

A summary of methods of making and testing laminated beams and arches with an illustrated description of some Swiss wooden structures. [Cf. *For. Abstr.* 9 (No. 1005).]

[1017]. 33.15.2 : 38.2 (494). ROS, M. Le progrès dans le domaine des constructions en bois collé en Suisse. [**Progress in the constructional use of glued laminated wood in Switzerland.**] *Les techniques du bois* 2, 1947 (65–8 + 12 plates). [F.]

The first part of the paper gives the results of laboratory tests to determine the strength requirements for constructional timber and glued laminated beams for use in bridge building, etc. The second part gives conclusions deduced from recent wooden structures in Switzerland, e.g. railway station roofs and railway bridges. The physical and mechanical properties of laminated beams glued with Melacol H are adjudged equal or even superior to those of natural wood.

33.15.3. *Improved Woods*

See also *For. Abstr.* 9 (No. 1227).

[1018]. 33.15.3. **Improved wood.** *Mimeo. For. Prod. Lab., Can.* No. 114, 1946. pp. [i] + 14. P.R.

A general review of developments in this field with a comprehensive bibliography.

[1019]. 33.15.3. SCHVARTZ, J. Les diverses techniques d'amélioration du bois. [**The various techniques for the manufacture of improved wood.**] *Les techniques du bois* 2, 1947 (56–8). [F.]

A brief review of the various processes employed in the production of improved wood, i.e. impregnation, compression, lamination and combinations of these. Data are given for modulus of elasticity, end compression, tensile strength and bending strength of improved laminated wood ('Permali') of different densities and resin contents, with plies in parallel and in in transverse grain; another table compares density (d), tensile strength (R) and the ratio $\frac{R}{d}$ for Beech wood, plastic, duralumin, steel, and laminated improved wood.

[1020]. 33.15.3 : 31.21.4. RICHARDS, C. E., and RADLEY, W. G. **Thermal and electrical properties of a resin-bonded laminated wood.** *Research Report, Post Office Research Station* No. 12275, 1945. pp. [2]. P.R.

The electrical and thermal properties of 'Permali' (laminated wood bonded and impregnated with phenol-formaldehyde resin) were investigated with a view to its possible use for large insulators. Data obtained are set out in the report. It was concluded that, for outdoor use, insulators made from 'Permali' would need a protective surface such as varnish. The electrical properties of the material are similar to those of a wood-filled phenol-formaldehyde resin. It is easily worked and machined. Its high thermal expansion in some directions might be a disadvantage.

[1021]. 33.15.3 : 31.22.2. MILLETT, M. A., and STAMM, A. J. **Wood treatment with urea resin-forming systems (dimensional stability).** *Mod. Plastics* 24 (2), 1946 (150–3, 202, 204, 206). P.R.

Thin cross-sections of Sitka Spruce, Sugar Maple and White Oak were impregnated with urea - formaldehyde resin - forming systems, either in the form of commercial dimethylolurea or as a mixture of urea and formalin. When properly cured, anti-shrink efficiencies of 40 to 50 per cent. can be obtained with either of these

resin mixes. This is about two-thirds of that obtainable with the water-soluble phenolic-treating resins at the same resin content. A 2 to 1 ratio of formaldehyde to urea was shown to give the best results. The urea-formalin mix was found to be superior to dimethylolurea in stabilizing wood dimensions. Buffering the resin-forming system at a pH of 8·0 not only gives higher anti-shrink efficiencies but also prolongs the life of the resin in the treating solution. Cure conditions were found to be about the same as for the phenolic-treating resins, namely, 310 to 320° F. for 20 minutes, or 220° F. for at least 48 hours. Lower temperatures than the latter required excessively long cures to give optimum anti-shrink efficiencies. Urea-formalin mixes seem to have somewhat better stability than dimethylolurea solutions when used under the same conditions. *Authors' summary.*

[1022]. 33.15.3. RUSSISHVILI, R. **Treatment of wood.** *Brit. Patent* No. 566,766, Jan. 12th, 1945. *Chem. Abstr.* 41, 1947 (1078). P.R.

To impart greater strength, pliability, and compressibility, wood is treated with a chemical solution suitable for removing the hemicelluloses, such as a solution of NaOH, Na_2CO_3, or a mixture of the two, with an admixture of Na_2SO_3; this treatment is followed by treatment with an acid solution. The wood is subsequently impregnated with a resinoid substance and subjected to pressure.

[1023]. 33.15.3 : 34.6 : 33.32.1. I.G. FARBENINDUSTRIE A.G. Verfahren zum Imprägnieren von Holz. [**Process for impregnating wood.**] *FIAT Microfilm Reel Patent* No. 142, PB19924, 1940. pp. 4. [G.] Bibliogr. Sci. industr. Rep. 3 (5), 1946 (370). D.S.I.R.

Wood is treated with sulphite waste liquor or lignin sulphuric acid in the presence of formaldehyde at temperatures between 90 and 150°C. Products having resin-like characteristics are thereby formed in the wood or on the surface. Addition of alkali, acids or salts accelerates the reaction.

[1024]. 33.15.3 : 12.26–8 : 31.1. BERLINER, J. F. T., PALESE, R. A. M., and BERRY, F. W. **Expanding the utility of Southern Elm through resin impregnation.** *Sth. Lumberm.* 175 (2190), 1947 (41–2). [Engineering Ass., St. Charles, Ill.]

In studies on the impregnation of a large number of species with methylolurea solution it was discovered that in the samples of Southern Elm the heartwood had treated as readily and completely as the sapwood. Further experiments were made on a number of Southern species (*Ulmus americana, U. fulva, U. alata, U. crassifolia*). The treatment consisted in subjecting the wood to a vacuum of about 28 in. for 30 minutes, introducing the resin solution warmed to 120° F. and applying pressure of 200 lb./sq. in. for one hour. The wood was then removed from the treating chamber and kiln dried. The solution employed was 30 per cent. by weight of resin solids of 4 parts dimethylolurea and 1 part urea; it was coloured for ease of observation. The results of impregnation are summarized in two tables. Generally speaking, the impregnation of specimens was uniform throughout heartwood and sapwood except that in every instance where heartwood and sapwood occurred in the same sample there was a narrow, sharply defined strip in the region of the sapwood/heartwood border that was not penetrated by the solution. The width of the band varied in different specimens from $\frac{1}{64}$ to $\frac{5}{32}$ in. and it was always noted in the inner or oldest sapwood immediately adjacent to the heartwood. Photographs of a sample piece of wood illustrate this phenomenon and show that the large springwood vessels in this zone are dyed, indicating that the solution filled these elements but failed to diffuse into the surrounding tissues. Tests of pH showed that this zone was intermediate between heartwood and sapwood in that respect, so that it is unlikely that acidity is responsible for the failure to accept treatment. Attention is drawn to studies on wetwood of Elm [cf. *For. Abstr.* 7 (No. 947); 9 (No. 1285)] which have shown that the disease is usually confined to the inner sapwood and heartwood, and it is suggested that there may be some morphological difference between the 'oldest sapwood' and the remaining wood, which influences the growth of the disease organism and may also have some bearing on the resistance to the penetration of impregnating solutions.

33.15.5. *Glues and Gluing*

[1025]. 33.15.5. **Gluing practice. Part I. The preparation and use of animal glues.** *Trade Circ. For. Prod. Aust.* No. 14 (rev.), 1946. pp. 12.

[1026]. 33.15.5. CAMPBELL, W. G. **Recent developments in synthetic resin glues for wood.** British Catalogue of Plastics. 1947. pp. 298–9. [The National Trade Press Limited, London.] P.R.

[1027]. 33.15.5. **Aerolite and Aerodux adhesives for the wood-working industries.** *Bull. Aero-Res., Duxford* No. 45, 1946. pp. 20. P.R.

[1028]. 33.15.5. THURSTON, J. T. **Manufacture of 'Pressal' adhesive.** *FIAT Final Rep.* No. 965, 1946. pp. 7. [Office of Military Government for Germany (U.S.).] P.R.

Gives details for manufacturing 'Pressal', which is a melamine-formaldehyde adhesive extended with 70 per cent. of a specially hydrolysed potato starch.

[1029]. 33.15.5. HIGGINS, H. G. **Synthetic resin adhesives. VI. The gluing operation.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 150, 1947 (2–3).

[1030]. 33.15.5. **Synthetic resin adhesives. VII. Techniques of pressing.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 152, 1947 (3–4).

[1031]. 33.15.5. VERRAT, G. Le procédé de collage à la colle Caurite 'mousse' dans la fabrication du contreplaqué. [**The process of gluing with Caurite glue foam in the manufacture of plywood.**] *Les techniques du bois* 2, 1947 (47–9). [F.]

[1032]. 33.15.5. WILLIAMS, E. G. **Contact pressure laminations.** *Chem. & Ind.* No. 26, 1947 (367–70). P.R.

In contact pressure laminating, pressures of one atmosphere or less are used, as, for example, in the vacuum rubber-bag technique, and all contact pressure resins should give good laminates under these conditions. The paper deals with the new laminating resins which cure by double bond polymerization. A good contact resin should contain no solvent or diluent which does not interpolymerize with the resin, should have a low vapour pressure, form no volatile products, have a suitable viscosity, be easy to catalyse and have a long life in the uncatalysed state, and should cure quickly to a hard, rigid non-brittle solid. Various types of resin fulfilling these requirements have been produced, all of which fall into one of the four following classes:—(*a*) allyl, methallyl and crotonyl derivatives; (*b*) maleic acid derivatives or alkyd-type resins; (*c*) acrylic derivatives; and (*d*) vinyl compounds. These are at present more expensive than the conventional phenolic and urea resins, but can be applied without expensive equipment and are particularly useful for laminating strong skins on a low-density core which would not stand the pressures needed by conventional resins. Techniques for manufacturing laminates of wood, fabric, etc., are discussed.

[1033]. 33.15.5. OLSON, W. Z., and BRUCE, H. D. **Variation in maximum allowable assembly time with age in the pot at time of spreading for four resin glues.** *Rep. U.S. For. Prod. Lab., Madison* No. 1546, 1946. pp. 6 + figs. P.R.

[1034]. 33.15.5 : 31.27. OLSON, W. Z., BRUCE, H. D., and SOPER, V. R. **Rate of development of joint strength by four resin glues on eight species of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1547, 1946. pp. 4 + tbls. + figs. P.R.

Tests with 3 room-temperature-setting glues and one intermediate-temperature-setting glue on 8 species of wood commonly used in aircraft showed that the development of joint strength varies with the species, and such variation may be of practical importance in commercial processes. In the two most extreme cases a room-temperature-setting resorcinol glue took about 3 hours longer at 80° F. to develop 200 lb./sq. in. joint strength on Douglas Fir than it did on Sugar Maple, and a similar type of glue required 10 minutes more heating at 120° F. to develop 300 lb./sq. in. strength on Douglas Fir than it did on Sugar Maple. Detailed results of the tests are given in graphical and tabulated form.

[1035]. 33.15.5. OLSON, W. Z., BRUCE, H. D., and SOPER, V. R. **Curing of resorcinol-resin glues at temperatures from 40° to 80° F.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1629, 1946. pp. 5 + tbls. P.R.

An account of tests made to ascertain the possibility of curing resorcinol-resin glues at low temperatures, and to determine the effect of curing, at a higher temperature, joints originally glued at low temperatures. Results are tabulated showing the joint strength of different glues under various conditions. The

conclusions are that it appears feasible to use resorcinol-resin glues at low temperatures to glue low-density woods, if the pressure can be maintained over long periods of time, and to glue high-density woods with resorcinol-resins plus formaldehyde hardener at a temperature of 50° F. with subsequent curing at a high temperature.

[1036]. 33.15.5. HALL, H. W. **Curing adhesive bonds in laminated structures.** *U.S. Patent* No. 2,406,680, Aug. 27th, 1946. *Chem. Abstr.* 41, 1947 (627). P.R.

Thermosetting plywood glue is cured by immersing the assembled lamination in paraffin (or other liquid inert to the glue) which is heated to the curing temperature of the glue.

[1037]. 33.15.5. WANGAARD, F. F. **Summary of information on the durability of woodworking glues.** *Rep. U.S. For. Prod. Lab., Madison* No. 1530 (rev.), 1946. pp. 16 + tbls. + figs. Cf. *For. Abstr.* 7 (No. 1289). P.R.

[1038]. 33.15.5 : 31.46. GABRIEL, A. E. **A comparison of the durability of 23 urea resins in glue joints exposed to nearly saturated air at 75° C. (167° F.).** *Rep. U.S. For. Prod. Lab., Madison* No. 1355, 1946. pp. 4 + tbls. + figs. P.R.

Birch plywood specimens glued with 23 urea-formaldehyde glues were exposed in glass jars to nearly saturated air at 75° C. (167° F.) for periods up to 96 hours and the joint strengths periodically tested. The rate of deterioration of the joints varied widely for different glues. For a few glues, where data were available, their behaviour agreed closely with the order of performance observed during prolonged exposure of plywood to laboratory controlled cycles and to the weather. The results indicate that this test might be used as a quick means of comparing the durability of different urea-resin glues. *From author's summary.*

[1039]. 33.15.5 : 31.27. LECHER, S. M. **Effects of boiling for various periods of time on the strength of joints in Birch plywood bonded with urea glue fortified with varying amounts of melamine and resorcinol.** *Rep. U.S. For. Prod. Lab., Madison* No. 1549, 1946. pp. 2 + tbls. P.R.

The results of shear tests on specimens indicate that more than 12 hours' boiling are required to reduce joint strengths of fortified urea glues below acceptable values. If boiling is being used as a test to distinguish fortified urea glues from low-temperature phenol, melamine or resorcinol glues, therefore, it is necessary to boil for periods longer than 12 hours.

[1040]. 33.15.5 : 07.7. **New press for gluing operations.** *Plastics Newsfr.* 2 (1), 1947 (2). P.R.

A description of the latest model Plycor Automatic Labour Press, produced by the Adamson United Company. The machine is equipped with a glue spreader and an automatic cut-off saw. The resin-glue joints are cured under high sustained pressure at a heat which vaporizes excess glue moisture, by means of solid steel drilled steam platens.

[1041]. 33.15.5 : 07.7. FISCHER-SUEFFERT, W. **Machine for gluing laths together.** *Brit. Patent* No. 582,981, Dec. 4th, 1946. *Timber News* 55 (2094), 1947 (148).

The patent refers to the design of a core-stock assembling machine which automatically groups, glues and presses the battens in readiness for insertion between the outer faces of built-up boards and panels. Several improvements in operation are claimed over existing machines of this type.

[1042]. 33.15.5 : 07.7. **'Curved' gluing feat of automatic model.** *Timber of Canada* 7 (10), 1947 (23).

A new Linderman automatic wood-fabricating machine which will join small strips of wood into solid curved shapes with glued dovetail joints having strength equal or superior to solid wood. Only three men are required to operate the machine.

[1043]. 33.15.5 : 07.7. LUSTY, W. K. **Appliances for gluing together pieces of wood.** *Brit. Patent* No. 582,963, Dec. 3rd, 1946. *Timber News* 55 (2094), 1947 (148).

The apparatus is designed for use in conjunction with a Linderman jointer, and is intended to give an accurate alignment of the jointed wood pieces after they have been grooved and glued. It comprises a saw table (for trimming the assembled boards exactly to width), and a power-actuated clamping arrangement which forces the wood pieces into alignment at the ends.

[1044]. 33.15.5 : 07.7. WINLUND, E. S. **Edge gluing economy and equipment—a tentative analysis.** *Bull. Univ. Wash. Coll. For.* No. 2, 1947 (41–7).

[1045]. 33.15.5 : 07.7. **New high frequency gluer.** *Sth. Lumberm.* 174 (2188), 1947 (70).

Description of the Hart-Union high-frequency edge gluer, an automatic unit including glue spreader, edge-gluing clamp, automatic infeed table and high-frequency generator, for which the claim is made that it will glue at least twice as much material each day as the conventional revolving clamp carrier.

[1046]. 33.15.5 : 07.7 : 33.15.1. THOMAS, D. P. **Electronic heat aids veneer splicing.** *Veneers & Plyw.* 40 (11), 1946 (14, 16). P.R.

Describes a conveyor press which is being constructed in a plywood mill of the Pacific Northwest to edge-glue veneers into long clear strips, a process which was developed in the Forest Products Laboratory of the University of Washington. It is designed to edge-glue 8- to 10-ft. lengths of veneer $\frac{1}{8}$ or $\frac{1}{10}$ in. thick. Conveyor belts pass the veneers through an electrostatic field.

[1047]. 33.15.5. : 07.7. **Radio frequency heating for gluing wood. An explanation of the workings of radio frequency heating, its possibilities and limitations.** *Timberman* 48 (7), 1947 (104–10). [Casein Company of America.]

[1048]. 33.15.5. **Glue; curing process, high frequency dielectric heating.** *U.S. Army Air Forces Specif.* No. 20041, 1945. pp. 10. P.R.

[1049]. 33.15.5 : 33.1. [GRONDAL, B. L., and KNAUSS, A. C.] **Wood technology as it relates to gluing: a panel discussion.** *Bull. Univ. Wash. Coll. For.* No. 2, 1947 (56–60).

Reasons for the indifferent quality of many synthetic-resin glue joints produced by radio-frequency heating are briefly discussed. It is pointed out that careful preparation of the wood is required for radio-frequency as for other forms of gluing. Only dry, well machined lumber should be used. Preliminary studies with infra-red as a means of eliminating moisture before the application of the glue show promise, but the method is not at present considered practicable.

[1050]. 33.15.5 : 33.12. MILLER, D. G. **Dielectric heating in the furniture industry.** *Repr.* from *Canad. Woodw. Furn. Mfr.* [*n.d.*] pp. [4.] P.R.

Discusses the principles of dielectric heating methods and their application to the furniture industry.

[1051]. 33.15.5 : 33.8 : (71.3). PHILLIPS, L. N. **Recent developments in plastics at the government laboratories, Ottawa.** *U.K.S.M. Memo* No. 29/47, 1947. pp. 6. P.R.

The Forest Products Laboratory, Ottawa, is investigating the application of dielectric heating to the gluing of wooden assemblies. The stray-field method is being used in bonding internal cross members of prefabricated housing panels to the outer skins, the parallel-field method to produce thick, laminated spars, and the perpendicular-field method to make a prototype suitcase of moulded wood.

[1052]. 33.15.5 : 07.7. LACEY, P. M. C., HOWE, H. A., and KNIGHT, R. A. G. **Radio frequency and other heating processes. Progress report 2. January 1946. Infra red heating for glue setting.** *Sci. tech. Mem. Minist. Aircraft Prod.* No. 9/46–FP.RIS 35, 1946. pp. 26 + figs. + plates. P.R.

An account of preliminary investigations on the use of infra-red heating for gluing wood. Incandescent-electric-lamp heaters were used. Radiation intensity and distribution and temperatures attained in the wood assemblies were studied. Three kinds of practical application were tested:—(1) Gluing of laminated beams; (2) gluing of small attachments to a preheated surface, using a concentrating spot lamp; (3) gluing a surface veneer to a curved block, using a blackened metal strip as a receiver.

[1053]. 33.15.5 : 33.15.4. SCHOLL, E. L. (to Dominion Rubber Co., Ltd.). **Laminated wood and metal.** *Canad. Patent* No. 437,430, Oct. 15th, 1946. *Chem. Abstr.* 41, 1947 (1497–8). P.R.

To accommodate the difference in expansion between wood and metal, a strong adhesive film of a thermoplastic rubber composition having the properties of tough resin is applied to the wood surface; a layer of vulcanizable rubber is applied over the film, treated with a

solution of P polysulphide to increase its adhesion to the metal, and vulcanized conductive particles are applied over the surface; a layer of metal is then electrodeposited on the vulcanized layer.

[1054]. 33.15.5 : 33.15.4 : 33.12 : 12.26–8. **Hardwood research develops improvements for furniture manufacturers.** *B.C. Lumberm.* 31 (4), 1947 (95). Also in *Veneers & Plyw.* 41 (5), 1947 (40–1).

A new process for gluing aluminium to a furniture core and face veneer has been perfected by the Timber Engineering Co., Washington, D.C. Two adhesives are used. The first is applied to the aluminium and is allowed to air-dry; the second forms a bond between the wood and the adhesive previously applied to the aluminium, and is one of the common, cold-setting variety. Since no heat is required, there is no danger of the expansion of the aluminium and subsequent warping of the wood.

33.17. Sawmilling

[1055]. 33.17 (595). CHIPP, W. F. **Some features of a modern type Chinese sawmill in Malaya.** *Timber News* 55 (2097), 1947 (246–8).

A description with plan of a small Chinese sawmill erected in Malaya to provide boxboards for tinned pineapple cases, and boards and small scantlings for general purposes. The forest exploited was of the freshwater swamp type with a variety of hard- and softwood species. An account of the mill's equipment and working methods is given. Average monthly (30 day) output was 48,300 cu. ft.

[1056]. 33.17 : 07.7. MAY. La scie radiale. **[The radial saw.]** *Les techniques du bois* 1, 1947 (87–8). [F.]

Description of a new woodworking machine, consisting of a saw mounted, together with its motor, on an overhanging arm by means of a sliding carriage. The overhanging arm and the stirrup supporting the motor can pivot horizontally for 360° round their respective axes, and the motor can turn vertically for 360° round its supports.

[1057]. 33.17 : 07.7. BIRCH, J. F. **Circular saws and their maintenance.** C. D. Monninger Ltd., Overbury Road, London, N.15. 1947. pp. 85.

[1058]. 33.17 : 07.7. HARRIS, P. **The mechanics of sawing: Circular saws.** *Wood* 12 (6), 1947 (159–63).

[1059]. 33.17 : 31.22.1. SMIRNOV, A. A. Vliyanie vlazhnosti na udelnuyu rabotu pri prodol'nom pilenii kruglymi pilami. **[The influence of moisture content on the relative expenditure of energy in rip-sawing with circular saws.]** *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 129–36. [Russ.]

Tests on Pine [*Pinus sylvestris*], Spruce [*Picea abies*] and Larch [*Larix decidua*] under specified sawing conditions, showed that for all three species the expenditure of work (energy) increased with increasing moisture content, based on oven-dry weight, between 7 and 30 per cent.; above 30 per cent. only Pine continued to require increased work with increasing moisture, whereas the work required to saw Spruce and Larch decreased progressively. The greatest rate of increase in work required between 7 and 30 per cent. moisture was shown by Larch, followed by Pine and Spruce, in that order. The rate of increase varied also in each of the three species with rate of feed per individual saw-tooth (as measured by mean thickness of 'bite' removed), the thinner the 'bite' the higher being the rate of increase in work expended.

For each species a table is given of correction factors for the effects of moisture content and mean thickness of the 'bite' removed, taking energy expended at 25–30 per cent. moisture as unity.

The results are illustrated graphically.

[1060]. 33.17 : 07.7. JOHNSON, R. C. **Lead indicating device for circular saw mill headrigs.** *Tech. Notes Lake St. For. Exp. Sta.* No. 267, 1947. p. 1 + fig.

[1061]. 33.17 : 07.7. JOHNSON, R. C. **Air dogs for small sawmills.** *Quart. Bull. Mich. agric. Exp. Sta.* 29 (3), 1947 (231–6).

Description of an improved type of compressed-air-dog assembly designed primarily for medium- to large-size circular mill carriages and for small band mill carriages, but capable of adaptation to lighter headblocks. The principal features in design are indicated. The chief advantages are (1) a material reduction in the work of the setter; (2) better dogging with resultant better grade of lumber; and (3) greater

safety. Observations suggest that production of lumber can be increased from 5 to 10 per cent. over hand dogging by the use of these air dogs. Blue-prints are available at the Department of Forestry, Michigan State College.

[1062]. 33.17 : 07.7 : 33.7 : 33.51. TICKLE, C. G. **Cross-cutting small round stuff. A new type of firewood and pit prop bench.** *Timber News* 55 (2095), 1947. (180–1).

An account of a demonstration of the McConnel Mobile Safety Saw. Includes the manufacturer's specification.

[1063]. 33.17 (931) : 12.25. WARD, W. C., and SYME, J. W. **The adaptation of Scandinavian sawing practices to the conversion of exotic softwoods in New Zealand.** State Forest Service, Wellington, N.Z. 1947. pp. [5]. [5th British Empire Forestry Conference, Great Britain, 1947.]

The results obtained from 7 years' use of North European log frames and edgers at Waipa near Rotorua have confirmed Scandinavian experience that such equipment cannot be seriously rivalled in securing the maximum yield of accurately sawn timber from small logs. Since the small Pine logs currently available in New Zealand are inferior to Scandinavian sawlogs, greater advantage probably accrues from the use of this equipment in this Dominion than in North European countries. The proportion of bowed logs in New Zealand, for example, is much higher than is commonly supposed, and from this material log-frame sawing permits a recovery comparable to that obtained from straight logs; this is achieved by orienting the log in one frame so as to saw a flitch containing the bow, and then guiding the flitch in a second frame so that the saw cuts follow the contour of the bow.

Close sorting of logs into 1-inch diameter classes has been found to be fully warranted, as has the practice of double-frame sawing, which permits sawing at a faster rate and yields a higher conversion. In double-frame sawing, logs up to 15 in. in diameter are sawn with 6 saws only in the first frame, so as to produce a cant from the centre of the log and two 1-in. boards from each side. The cant is resawn into boards in the second frame. If the whole log were to be converted into boards in a single frame, more saws would have to be carried in this frame, which would necessitate a reduction in the sawing rate.

[1064]. 33.17 (943). STRONG, A. S. **Mill studies in Queensland.** *Aust. Timb. J.* 13 (4), 1947 (237, 239, 241, 243, 245–7, 249, 251, 253, 257).

The writer directed a co-operative study of Queensland milling operations. The project is a time study of milling procedure, and investigations at each mill last from one to two weeks. The original plan was to study hardwood milling, but Pine thinnings and scrub-woods have now been included. The studies involve the timing in minutes and seconds of the work of mill employees, classified according to the type of work performed. This article gives an account of the methods of study and an assessment of the value of such studies as providing basic data for determination of manufacturing margins for price fixation, more accurate stumpage evaluation of hardwood species and Pine thinnings, deciding what logs to leave in the bush, estimating percentage of recovery, checking current grading practice, analysing the economics of milling. There are also general remarks on mill design and organization and the standardizing of mill-study procedure, and a discussion how far mill studies represent average performances. [Cf. *For. Abstr.* 9 (No. 1365).]

33.3. *Chemical Treatment*

See also *For. Abstr.* 9 (Nos. 925–8, 980, 989).

Use of Wastes

See also *For. Abstr.* 9 (Nos. 995, 1023, 1082).

[1065]. 33.3 : 34.6 (73). **Stream improvement research.** *Chem. Engng. News* 25 (22), 1947 (1579). D.S.I.R.

The U.S. National Council for Stream Improvement has organized specialized regional research projects in areas close to pulp, paper and paperboard mills. These and also the progress made by nine of the institutions engaged on waste disposal research are briefly described.

[1066]. 33.3 : 34.6 : 12.25. **Turpentine recovery in pulp mills.** *Pulp Paper Mag. Can.* 48 (7), 1947 (79–81).

Crude turpentine or pinene can be recovered from certain coniferous pulpwoods, particularly Southern Yellow Pine and Longleaf Pine, during the cooking period of a wood charge in

digesters. The extent of recovery varies from 1½ to 4 gals. per ton of pulp produced, depending on the type, age and provenance of the wood. Details are given of the design and operation of a unit for the recovery of turpentine, manufactured by the Foster Wheeler Corporation, New York.

[1067]. 33.3 : 34.6 : 12.25. BRAUNS, F. E. **The stability of the methoxyl groups in methylated hydrochloric acid Spruce lignin.** *J. Amer. chem. Soc.* 68 (9), 1946 (1721–4). D.S.I.R.

[1068]. 33.3 : 34.6. GUILLON. La récupération et la combustion des liqueurs noires dans les fabriques de cellulose à la soude. **[The recovery and combustion of black liquors in the manufacture of soda pulp.]** *Les techniques du bois* 2, 1947 (182–5). [F.]

[1069]. 33.3 : 34.6. ASSOCIATED PULP AND PAPER MILLS LTD. **Electrolytic recovery of soda from alkaline process wood-pulp liquor.** *Brit. Patent* No. 580,123, Aug. 20th, 1946. *Chem. Abstr.* 41, 1947 (1841). P.R.

Caustic soda can be recovered by electrolytic means from the black liquor of the alkaline-process pulping of wood. The black liquor is passed through two compartments. The first is an electrolytic cell with a Hg cathode for absorbing the liberated Na. The anode is arranged for continuous or periodic removal and recovery of the precipitated acidic components derived from the treated wood. The electrolysis is continued to 60–70 per cent. removal of original soda. The solution is then passed into the second compartment, where it is treated with Na amalgam from the first compartment for regeneration of NaOH. Additional caustic or soda and black liquor can be added to produce a liquor suitable for re-use in the digester. The electrolyte from the first compartment can be subjected to hydrolysis and fermentation for utilization of certain soluble organic constituents. Flow sheets illustrate the process.

[1070]. 33.3 : 34.6. NELSON, W. D. **Purification of solutions by lignin.** *U.S. Patent* No. 2,415,439, Feb. 11th, 1947. *Chem. Abstr.* 41 (9), 1947 (2922). P.R.

Addition of cellulose-free lignin in neutral aqueous suspension or in alkaline solution facilitates the classification of syrups, sugar juices, molasses, waste liquors. The lignin is obtained from wood, bagasse, etc., by the soda or the sulphate process, and should be used without drying. It can be stored indefinitely as a wet paste.

[1071]. 33.3 : 34.6 : 34.26. KEILEN, J. J., and POLLAK, A. **Lignin for reinforcing rubber.** *Industr. Engng. Chem.* (*Industr. Ed.*) 39 (4), 1947 (480–3). P.R.

Lignin as made from the waste black liquor of the sulphate process, is an effective reinforcing agent for synthetic or natural rubbers when incorporated into latex by the co-precipitation or master batching procedure. GR–S reinforced in this manner with 38·5 volumes of lignin, yields vulcanizates having a tensile strength of 2,900 lb./sq. in. and a tear resistance of 380 lb./in., values exceeded only with channel black. With 77 volumes loading the tensile strength of 2,800 lb./sq. in. and tear resistance of 550 lb./in. are higher than those for any other pigment tested. In abrasion resistance lignin vulcanizators are between carbon blacks and the common inorganic fillers. Shore hardness values are close to those for channel black. Lignin-reinforced rubbers weigh appreciably less per unit volume owing to the low specific gravity, 1·3, of lignin. The brown colour of lignin permits a wide colour range, without sacrifice of mechanical properties, by blending with white pigments. Lignin co-precipitates require only a brief milling time for complete mastication. Details are given of the preferred procedure for preparing master batches of lignin and GR–S. Other suggested incorporation procedures made possible by the colloidal properties of lignin are reviewed. *Authors' summary.*

[1072]. 33.3 : 34.6. ARIES, R. S. **Recent developments in the utilization of sulfite waste liquors.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 14, 1947 (97–123). L.S.

[1073]. 33.3 : 34.6. VIEZ, H.-M. Utilisation des lessives résiduaires de la cellulose au bisulfite. **[Utilization of sulphite waste liquors.]** *Les techniques du bois* 2, 1947 (177–81). [F.]

A general review of the progress so far made. The references cited are mainly German and French.

[1074]. 33.3 : 34.6 : 31.3. MCCARTHY, J. L. **The nature of sulfite waste liquor.** *Paper Mill News* 69 (7), 1946 (48, 50, 52). P.A.T.R.A.

[1075]. 33.3 : 34.6 : 31.3. PENISTON, Q. P., FELICETTA, V. F., and MCCARTHY, J. L. **Sulfite waste liquor analysis. Determination of sulfate by a conductrometric titration method.** *Anal. Chem.* 19 (5), 1947 (332–4). P.R.

[1076]. 33.3 : 34.6 : 31.3. KRATZL, K. Die Ligninsulfonsäure und ihre technische Verwertung. [**Lignin-sulphonic acids and their technical utilization.**] *Experientia* 2 (Fasc. 12), 1946 (469–76). [G.e.] D.S.I.R.

A summary of research on the constitution of the lignin-sulphonic acid and an account of progress in their utilization.

[1077]. 33.3 : 34.6 : 34.24 : 12.26–8 : 12.25. BUCHANAN, M. A., LOLLAR, R. M., and NIEMEYER, D. D. **The tanning properties of lignosulphonates produced by different cooking conditions.** *Paper Tr. J.* 124 (18), 1947 (38–44). P.R.

A short review is made of research into the use of lignosulphonates in tanning. Experiments were made with Aspen and Spruce wood in order to determine the effect of cooking variables and wood species on the tanning properties of the resulting sulphite waste liquors. From a leather-making standpoint none of the sulphite waste liquors was very satisfactory. The Aspen liquor had the poorest tanning characteristics and can scarcely be said to tan at all, even though it is taken up by hides. The best liquor was that obtained by cooking Spruce under conditions used to produce rayon pulp, which may be said to give a low-grade tannage. Contrary to Gustavson's findings, low pH tannages are not necessarily the best for lignosulphonates, nor do the latter always act as disaggregating agents for collagen. The desirability of lignosulphonates for leather-making appears to be directly correlated with their precipitability with high-molecular-weight amines, such as beta-naphthylamine. *From authors' summary.*

[1078]. 33.3 : 34.6. BRAUNS, F. E., and PEARL, I. A. (to Sulphite Products Corp.). **Degradation of lignin.** *U.S. Patent* No. 2,417,346, Mar. 11th, 1947. *Chem. Abstr.* 41, 1947 (3625). P.R.

Lignin materials and alkali in the ratio of about 2 : 1 are heated with alcohols (such as butanol, isobutanol, pentanols, benzyl alcohol or cyclohexanol) which do not substantially raise the pressure of H_2O at a temperature of approximately 300° F. Ca lignosulphonate 15, $Ca(OH)_2$ 15, BuOH 97, and H_2O 120 parts are heated for 0·5 hour at 300°; or sulphite-waste-liquor solids 300 and $Ca(OH)_2$ 300 parts are heated with a 1 : 1 mixture of BuOH–H_2O containing about 1,200 parts H_2O for 1 hour at 297–303°; a suggested method is given for separating the degraded products into aldehydes, phenols and neutral products.

[1079]. 33.3 : 34.6 : 33.32.4. **Lignin plastics.** British Catalogue of Plastics. 1947. pp. 231. [The National Trade Press Limited, London.] P.R.

A brief summary of the main processes of making lignin plastics from sulphite waste liquor, wood-waste and cane sugar residues.

33.32. Pulp and Paper Manufacture. Wallboards. Plastics

See also *For. Abstr.* 9 (Nos. 926–7).

[1080]. 33.32 : 35 : 09.4. KELLOGG, R. S. **World production of newsprint paper.** *Pulp Paper Mag. Can.* 48 (8), 1947 (57–9).

Report on a study made by the Pulp and Paper Section, U.S.D.C., and the News Print Service Bureau. All figures are given for 1939 and 1946; they include world production and consumption compared with those of the United States and production by countries from 1928 to 1939. Of the total world production of about 7 million tons in 1946, the United States produced 11 per cent. and consumed 61 per cent.

[1081]. 33.32 (438) : 09.4. MARCHLEWKA-SZRAJER, H. **The present condition of the Polish paper industry.** *Abstr.* in *Pulp Paper Mag. Can.* 48 (7), 1947 (68–9). From *La Papeterie*, Dec., 1946.

Includes statistics on area, ownership and distribution of species of Polish forests in 1938 and 1945 respectively; production of the pulp and paper industry in thousands of tons in the years 1929, 1934, 1937, 1938, 1945 and the first half of 1946; and number of mills.

[1082]. 33.32 (431–5) : 34.6 : 12.25. HUNTER, W. **Zellstofffabrik A.G. Mannheim.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 741, Item No. 22, [*n.d.*] pp. 7. P.R.

The factory produced pulp from Spruce for paper, and cellulose from Beech for viscose manufacture. The waste sulphite liquor from the Spruce process was fermented to make alcohol. Methods and apparatus are described and illustrated.

[1083]. 33.32 (54). BHARGAVA, M. P. **Review of the pulp and paper industry in India.** Forest Research Institute, Dehra Dun. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

[1084]. 33.32 (72). ARIES, R. S., and SERRANO, J., JR. **Summary of Mexican paper industry.** *Paper Ind.* 29 (1), 1947 (69–71). P.R.

A brief history of the paper industry in Mexico is given, and the forest resources of the country are discussed. Only the forests of the subtropical transition belt and the coniferous forests are of interest as regards the supply of softwoods for paper-making. The coniferous region is the most extensive and important forest region of the country, but it is largely undeveloped because of its location and the lack of means of transport. Most authorities agree that the areas of Durango and Chihuahua are the most suitable for exploitation. Among Mexican railway projects, which would open up forest regions, is a plan to connect El Fuerte in the State of Sinaloa with Sanchez in Chihuahua, which would open up the Pine forest on the western slope of the Sierra Madre Occidental in western Chihuahua. The article includes a table showing areas and volume of Pine timber by States in Mexico.

[1085]. 33.32 (81). BANDEIRA, B. R. P. O papel. Sua fabricação no Brasil. [**Paper. Its manufacture in Brazil.**] *Rev. flor., Rio de J.* 5 (1), 1946 (27–36). [Port.]

Paraná Pine [*Araucaria angustifolia*] and *Eucalyptus* spp. (particularly *E. tereticornis* and *E. saligna*) are the species most commonly used for paper-making in Brazil. Thirty Brazilian factories making paper are listed.

[1086]. 33.32. VILARS, J. Apercu de nos connaissances actuelles sur la pâte mécanique. [**A short review of our present state of knowledge on the subject of mechanical pulp.**] *Les techniques du bois* 2, 1947 (148–50). [F.]

For papers containing a large proportion of mechanical pulp, tearing strength is the fundamental quality and in a given mill it is always the same for a given species. In order to apply this satisfactory criterion for classifying pulpwood, the use of a laboratory defibrator is advisable.

[1087]. 33.32 : 12.26–8 (666.8). LE CACHEUX, P. L'utilisation des essences tropicales dans l'industrie des pâtes et papiers. [**The utilization of tropical species in the pulp and paper industry.**] *Les techniques du bois* 2, 1947 (151–6). [F.]

Cf. *For. Abstr.* 9 (No. 398).

33.32.1. *Pulp Manufacture*

[1088]. 33.32.1. CUNDY, P. F., and BECK, M. M. **The determination of alpha-cellulose in unbleached pulps.** *Paper Tr. J.* 124 (18), 1947 (36–7). P.R.

Correction for the presence of lignin in the alpha-cellulose residue from unbleached pulps may be made by determining the lignin content of the residue, but this is a slow operation of doubtful accuracy. Details are given of a method of delignifying the pulp by the use of sodium chlorite. *From authors' summary.*

[1089]. 33.32.1 : 07.7. WARDWELL, N. P. **Some facts and thoughts about woodroom equipment.** *Paper Tr. J.* 124 (22), 1947 (82, 84). P.R.

A discussion and practical recommendations on the use of 'multiknife' chippers.

[1090]. 33.32.1 : 07.7. SUTHERLAND, L. M. **Progress report on stock preparation.** *Paper Tr. J.* 124 (22), 1947 (112, 114, 116, 117). P.R.

A discussion of modern methods and equipment in preparing stock for pulping. A fairly detailed account is given of the Sutherland Single Rotating Disk Refiner.

[1091]. 33.32.1 : 07.7. Note sur le raffineur Bauer. [**Note on the Bauer Refiner.**] *Les techniques du bois* 2, 1947 (170–3). [F.]

Specification, details of construction and installation, and method of operating the Bauer refining machine, which is used for the production of groundwood, semi-chemical pulp, kraft pulp, wallboard and wrapping paper.

[1092]. 33.32.1 : 07.7. SUTHERLAND, D. M. **Progress report on continuous refining of high yield pulps at high temperatures and alkalinity.** *Paper Tr. J.* 124 (15), 1947 (49–51). P.R.

[1093]. 33.32.1 : 07.7. MILOV, B. G. **Removing resins which separate from paper pulp in beaters.** *U.S.S.R. Patent* No. 66,004, Mar. 31st, 1946. *Chem. Abstr.* 41, 1947 (1841). P.R.

The resin is collected on a solid hydrophobic material. For this purpose, there can be employed a rotating drum partly submerged in the pulp and coated with copper, brass, rubber, paraffin, oil-impregnated cloth, or kraft paper.

[1094]. 33.32.1. BRITISH CELANESE LTD. **Esterified wood pulp: bleaching.** *Brit. Patent* No. 581,046, Sept. 30th, 1946. *Brit. Cotton Ind. Res. Ass. Summ.* 27 (4), 1947 (78). D.S.I.R.

Partially esterified wood pulp (especially that with an acetic-acid yield of 25·2 per cent.) is bleached by treatment with a solution of a lower aliphatic per-acid in a lower fatty acid.

[1095]. 33.32.1. VINCENT, G. P. **Bleaching pulp with mixtures of chlorine dioxide and chlorine.** *Paper Tr. J.* 124 (26), 1947 (53–5). P.R.

The use of mixtures of chlorine and chlorine dioxide for bleaching sulphate pulp to exceptionally high brightness with retention of strength is described. Conclusions are that such mixtures give results equivalent to pure chlorine dioxide, with operating economies. Hypochlorite bleaching shows excessive degradation in the final bleaching stages compared with a chlorine-dioxide solution used with or without chlorine.

[1096]. 33.32.1 : 12.25. LAWRENCE, W. P. **Chlorite bleaching of Southern Pine kraft pulp.** *Paper Tr. J.* 124 (21), 1947 (38–40). P.R.

Alkaline chlorite was found to give very satisfactory results in specialized applications as a finishing bleach for raising Southern Pine (*Pinus palustris*) kraft pulp to G.E. brightness 80 to 83, with good retention of strength characteristics.

[1097]. 33.32.1. SCHUR, M. O., and LEVY, R. M. **Influence of oxidation of pulp on wet strength.** *Paper Tr. J.* 124 (20), 1947 (43–6). P.R.

A study was made of the effect of oxidizing a semi-bleached kraft pulp with sodium periodate or with sodium hypochlorite in aqueous solution on the beating characteristics of the pulp and on the properties of handsheets prepared from the beaten pulp. Pulp treated with periodate became progressively more difficult to beat with increased oxidation. Handsheets from the pulp showed a corresponding loss in dry tensile strength and an increase in porosity. These handsheets were all relatively high in wet strength. Pulp treated with hypochlorite developed slowness during beating more rapidly than the untreated pulp. The dry tensile strength of the corresponding handsheets was increased, except where the viscosity was greatly decreased by the oxidant, and the handsheets were less porous. The wet strength of the handsheets was higher than in the case of untreated pulp similarly beaten, but not as high as in the case of the periodate-treated pulp. The level of wet strength gained, within the limits of the experimental conditions studied, appears to depend upon the degree and method of oxidation; fibre length also enters as a factor. *From authors' summary.*

[1098]. 33.32.1 : 12.25 (79) : 22.15. HATCH, R. S., and HOLZER, W. F. **Pacific coast pulpwoods.** *Paper Ind.* 29 (3), 1947 (443–9). P.R.

A summary of the pulping characteristics of the main softwoods of the Pacific Coast region is given.

Pulps of the Pacific Coast region are characterized by (1) the large size of the fibres, which produce a strong pulp and bulky porous paper; (2) a tendency to resist refining treatment and to fibrillate more than pulps from other regions; (3) a greater natural organic dyestuff content.

During the war, Douglas Fir was increasingly used for pulping and it is now pulped commercially by the kraft process. The pulp can be bleached to a brightness rivalling pulps of other species and possesses high tearing strength and folding endurance. The heartwood cannot be pulped by conventional sulphite processes, and modifications to suit this species have not reached the commercial stage.

The sapwood can be sulphite-processed without serious difficulty, but yields a pulp of poor quality.

The economic aspects of the pulp industry are also discussed. It is estimated that approximately 25 cords of sound wood per acre are left on the ground after a logging operation in the Pacific Northwest. An economic means of salvaging this material along with thinnings of second-growth stands would tap a new and considerable source of pulpwood. Waste from large Douglas Fir sawmills, now used in many sulphite mills for fuel, could be diverted to pulping purposes if a magnesium base instead of a calcium base were used. With a magnesium base the sulphite waste liquor can be evaporated and burnt for fuel, and the magnesium and sulphur recovered. [Cf. *For. Abstr.* 8 (Nos. 1210, 1233).]

[1099]. 33.32.1 : 12.25 : 33.1 : 34. BRAY, M. W., and MARTIN, J. S. **Sulfate pulping of Douglas Fir, Western Hemlock, Pacific Silver Fir, and Western Red Cedar logging and sawmill waste.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1641, 1947. pp. 10 + tbls. P.R.

Pulping experiments were made at the Forest Products Laboratory to determine the suitability of logging and sawmill waste from four major western species (Douglas Fir, Western Hemlock, Pacific Silver Fir, Western Red Cedar, and various mixtures of these) for the production of strong kraft and bleachable sulphate pulps. Although higher yields of kraft pulps, based on moisture-free weights, were obtained from Western Hemlock and Pacific Silver Fir than from Douglas Fir, the Douglas Fir excelled all others in yield per unit volume of wood. The lowest yield of kraft and bleachable sulphate pulps, on both a volume and weight basis, was obtained from Western Red Cedar, but both the kraft and bleachable sulphate pulps from this species excelled all others in several of the most important strength properties though not in tearing strength. Because of these characteristics proper blending of the fibres of Western Red Cedar with those from species that excel principally in tearing strength, such as Douglas Fir, should be helpful in the production of pulps of balanced quality. In general, the experiments indicated that no difficulty should be experienced in cooking various mixtures of these four western species by the sulphate process and that logging and sawmill waste obtained from them is suitable for the production of good-quality kraft and bleachable sulphate pulps. *From authors' summary.*

[1100]. 33.32.1 : 33.1 : 34.6. KELLER, E. L., and MCGOVERN, J. N. **Sulphite pulps and papers from sawdust and chip mixtures.** *Pulp Paper Mag. Can.* 48 (7), 1947 (72–5).

The properties of sulphite pulps and papers from mixtures of Eastern Hemlock pulpmill sawdust and Spruce chips as determined by tests performed at the Forest Products Laboratory at Madison are reported. Although it was possible to produce a relatively high yield of pulp from sawdust alone, the pulp was dirty, dark-coloured and weak. Pulp from a mixture of 75 per cent. sawdust and 25 per cent. chips was made into 9-point paperboard which compared favourably with a commercial Pine groundwood corrugated board, and a mill wrap of relatively high quality. The yields, bleach requirements, and physical and chemical properties of the pulps made from sawdust and chips mixtures were found to be commensurate with the relative proportions of their sawdust and chips contents.

[1101]. 33.32.1 : 12.25–9 (73). MCGOVERN, J. N., SCHAFER, E. R., and MARTIN, J. S. **Pulping characteristics of available Lake States and Northeastern woods.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1675, 1947. pp. 16 + tbls. [Also in *Monogr. Ser. tech. Ass. Pulp Pap. Ind., N.Y.*] P.R.

A report on tests of the suitability for pulping of hardwoods and some little used softwoods, by mechanical, chemical and semi-chemical processes. The conclusions drawn are favourable. The bleached hardwood sulphate pulps approach the softwood sulphite pulps in strength, and the weaker soda pulps have qualities of bulk, opacity and absorbency. The hardwood sulphite pulps, except Birch, lack strength, but they give a good finish to paper. Bleached semi-chemical hardwood pulps are of exceptional strength and give a high yield.

[1102]. 33.32.1 : 12.26–8 : 06.2. **New developments in hardwood pulp. Report of conference at Syracuse, New York,**

October 2, 1946. *Bull. Ntheast. Wood Utiliz. Coun.* No. 14, 1947. pp. 123. L.S.

Possibilities of an increased use of hardwoods for pulping is of great importance in the Northeastern states of the U.S. because of the considerable surplus of growth over drain in hardwood stands. The conference report gives papers dealing with developments in hardwood pulpings in Sweden and Germany [cf. *For. Abstr.* 8 (No. 1937)] and the technical problems of adapting pulping processes to hardwoods.

[1103]. 33.32.1 : 12.26–8 (74). McGovern, J. N. **Some problems in the pulping of Northeastern hardwoods, with discussion.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 14, 1947 (43–58). L.S.

The suitability and adaptation of different pulping processes to hardwoods are discussed. Hardwood soda pulps are used for bookpaper, etc., where strength is not important. The sulphate process produces the strongest hardwood pulps made by conventional processes. With some adjustments hardwoods can be satisfactorily pulped by the sulphite process, but the pulp can again only be used where strength is unimportant. Paper Birch sulphite pulp, however, has strength properties approximately equivalent to Eastern Hemlock sulphite pulp. Sodium sulphite processes are suitable for hardwoods and produce a pulp of better strength properties. The problem here is the development of a method of recovering the soda value in the spent liquor. Semi-chemical pulping is particularly suitable for hardwoods and is used for making corrugated board and coarse wrapping paper. Aspen neutral sulphite semi-chemical pulps have been successfully bleached by conventional procedures and produce a high yield of bright pulp with good strength properties. Tests show that bleached Birch semi-chemical pulps also have similar high strengths.

[1104]. 33.32.1 : 12.25–3 (74). Phelps M. W. **Application of neutral sulphite semi-chemical process to Northern hardwoods, with discussion.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 14, 1947 (59–74). L.S.

Digestion and bleaching conditions for producing neutral sulphite semi-chemical pulp from Northern hardwoods are described. Manufacturing costs of semi-chemical pulp are not as low as the high yields would indicate.

33.32.3. *Wallboards, Fibreboards, etc.*

See also *For. Abstr.* 9 (No. 995).

[1105]. 33.32.3 : 34.6 : 33.1 : 33.32.4. Sette. La technique de fabrication des bois reconstitués et ses possibilités d'avenir. [**The technique of manufacturing reconstituted wood, and its future possibilities.**] *Les techniques du bois* 3, 1947 (28–30). [F.]

A general account of the advantages of wallboard, etc. manufactured from wood waste. Successful experiments have already been made in the direct moulding of reconstituted wood. A table gives a scale of physical and mechanical properties of reconstituted wood ('Interwood' and 'Xylithe').

[1106]. 33.32.3 : 34.6 : 33.1. Collardet, J. Les panneaux de fibre ou de déchets de bois agglomérés aux liants hydrauliques. [**Fibre boards or compressed wood-waste boards with hydraulic binders.**] *Les techniques du bois* 3, 1947 (42–4). [F.]

[1107]. 33.32.3. Winters, D. W. **Feltwood in forest management.** *J. For.* 45 (6), 1947 (447–8).

Wood fibre is now widely used in the manufacture of roofing felts. Wood of a lower grade than that required for pulpwood is acceptable; almost any species may be used, the wood need not be peeled, and knots are no defect.

[1108]. 33.32.3 : 07.7 (431–5). Aisher, O. A., Bessey, G. E., Blenkinsopp, W. K., Freedlander, M. J., and Morris, E. **The German wood-wool building slab industry.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 956, Item No. 22 [1946?]. pp. 44 + figs. P.R.

Seven factories making wood-wool building slabs by various processes and with varying degrees of mechanization were visited, and interrogations of technicians and others connected with the industry were carried out at these works and elsewhere. Details of the materials and processes used are given in the body of the report and appendices give details of machinery, production cost and other economic considerations, uses of these slabs in Germany, properties of the slabs and addresses of manufacturers of machinery and of the wood-wool building slabs. *Authors' summary.*

33.33. Manufacture of Textiles from Wood

[1109]. 33.33 : 12.26–8. La cellulose de châtaignier pour textiles artificiels. **[Chestnut pulp for artificial textiles.]** *Les techniques du bois* 2, 1947 (174–6). [F.]

33.36. Wood Finishes. Preservation of Wood. Seasoning and Drying

[1110]. 33.36. PARTEE, W. W. (to E. L. Bruce Co.) **Wood finishing.** *U.S. Patent* No. 2,339,511, Jan. 18th, 1944. *Brit. Abstr.* BII, 1947 (31). P.R.

Wood floor units in motion along a production line are subjected to the following successive operations: sanding; treatment with a penetrating coating composition based on drying oil, resin, and solvent; wiping after about 8 minutes; application of a filler, consisting of solid particles suspended in a volatile vehicle, before the coating has dried, and brushing after about 2–3 minutes. Soluble dyes may be incorporated in the coating composition or filler.

33.36.1. *Preservation against Attack by Plants and Animals*

See also *For. Abstr.* 9 (Nos. 959, 1227).

[1111]. 33.36.1 (431–5) : 33.31. PETERS, F. Vue générale des procédés et produits de préservation du bois utilisés en Allemagne avant et pendant la guerre en tenant compte particulièrement des méthodes employées par les chemins de fer et les services des postes et du télégraphe du Reich. **[General account of wood-preservation processes and substances used in Germany before and during the war, with particular reference to the methods used by the railways and State postal and telegraph service.]** *Rev. int. Bois* 14 (119), 1947 (114–8). [F.]

[1112]. 33.36.1 : 33.31. HÄGER, B. O. (to Bolidens Gruvaktiebolag). **Wood preservative.** *U.S. Patent* No. 2,408,978, Oct. 8th, 1946. *Chem. Abstr.* 41, 1947 (559–60). P.R.

Mixtures containing a soluble arsenate, a soluble fluoride, a soluble chromate (or dichromate), and a soluble salt of either Ca, Mg, Zn or Al and with sufficient acidity to prevent precipitation in water, are described. When wood is treated, insoluble arsenates and fluorides are formed *in situ* and are not easily leached out.

[1113]. 33.36.1 : 12.26–8 : 31.42.1 : 31.43. HOLMES, C. H. **Prevention and/or control of insect borers and fungal stains and decay on Malaboda—*Myristica dactyloides* Gaertn.** Ceylon Govt. Press, Colombo. 1947. pp. 10. [5th British Empire Forestry Conference, Great Britain, 1947.]

Experiments in surface coating of logs, barked or unbarked, with selected preservatives have shown that none are really of any use. Stacking logs well above ground was found to give no advantage. Logs kept immersed in water remained sound only so long as they remained in the water. In the case of sawn timber, all decay and borer infestation can be satisfactorily prevented by brush coating with, or momentary steeping in baths of, any of the following preservatives: lime wash, 10-per-cent. hot aqueous solution of borax, cold aqueous solution of Ascu ($\frac{1}{4}$ lb. to the gallon), 5-per-cent. cold aqueous solution of sodium silico-fluoride, 1-per-cent. aqueous suspension of Gammexane P.C. 1147, 2-per-cent. petrol solution of Gammexane P.C. 982, and 1-per-cent. petrol solution of D.D.T.

Starch depletion by deep sub-crown and basal girdling for borer control has been attempted. Planks from trees felled up to 11 months from initial girdling were found to be susceptible to borer infestation in due course. Planks from the top end log of the last tree to be felled at the end of 19 months from initial girdling have been found to be much less affected than planks from other sections of the same tree. This appears to be linked with a similar gradient of hydrolysable polysaccharide contents. *From author's summary.*

[1114]. 33.36.1 : 33.31. Le créosite. **["Creosite"].** *Rev. int. Bois* 14 (119), 1947 (118–20). [F.]

'Creosite' (patent owned by the Sté. Ame. Le Créosotage Universel, Charleroi), is a super-creosote of high permanent toxicity, derived from the distillation of tar oil, and applicable by cold soaking, which has been widely used in Belgium for 25 years past. Its toxicity is notably superior to that of ordinary creosote (it contains 25 per cent. of phenols compared with 7–8 per cent. in ordinary creosote) and so

is its fluidity. Permanence of toxicity is ensured by the non-volatility and water-insolubility of its chemical constituents.

[1115]. 33.36.1 : 33.31 : 31.42.1. KÜHLWEIN, J. Méthodes de vérification de laboratoire des produits pour la protection du bois. [**Methods for laboratory testing of wood preservatives.**] *Rev. int. Bois* 14 (119), 1947 (110–3). [F.]

The methods described include inoculation of test specimens and periodic weighing, measuring the growth of mycelium in test-tubes in a mixture of agar and fungicide, and testing the impact resistance and bending strength of inoculated specimens.

[1116.] 33.36.1 : 33.31 : 31.42 : 31.43. KROGH, P. M. D. **The comparative efficiency of preservatives in wood exposed to termites and decay.** [Department of Forestry, Pretoria.] 1947. pp. 11 + plates + tbls. [5th British Empire Forestry Conference, Great Britain, 1947.]

Describes an experiment, initiated in 1923, to discover the relative repellence of various wood preservatives when in contact with the ground and exposed to the ravages of termites attended by other destructive agencies. The efficacy of the preservatives is disclosed in a tabular statement giving the average life of each in years. The older methods of preservation are discussed and their weaknesses disclosed. The experience gained in a pilot experiment provided a valuable guide for the design of a replicated experiment begun in 1945, which included what is believed to be a new technique with which to ensure radial penetration of liquids into wood, of optimum depth with prescribed absorption. *From author's summary.* [Cf. *For. Abstr.* 8 (No. 1960); 9 (No. 942).]

[1117]. 33.36.1 : 33.31 : 31.43 (931). KELSEY, J. M. **Tests with timber preservatives in New Zealand.** *N.Z. J. Sci. Technol.* 27B (6), 1946 (446–57). P.R.

Three water-soluble and three oil-soluble timber preservatives were tested for effects in retarding oviposition and larval survival of *Anobium punctatum*, and effects of various brush coatings on survival of *Anobium* larvae and *Calotermes brouni* in already infested timber. Recommendations, alternative formulae and service records are given.

[1118]. 33.36.1 : 33.52. GUILLAUME, P. Préparation et conservation des traverses de chemin de fer. [**The manufacture and preservative treatment of railway sleepers.**] *Rev. int. Bois* 14 (119), 1947 (101–2). [F.]

An account of the methods employed by the S.N.C.F. Oak, Beech, Hornbeam, and certain Pines are the species used and the sleepers are kiln dried before impregnation with creosote by the Bethell or Rüping processes (described). The life of treated Oak sleepers is 25, and that of Beech 30 years.

[1119]. 33.36.1 : 33.52 : 31.4. **Test of Hemlock railroad ties completed.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 51, 1947. pp. 2.

Final report on a test track laid down in 1909 with creosoted sleepers of several species. Average life in years was as follows: Western Hemlock [*Tsuga heterophylla*] 30·6, Western Larch [*Larix occidentalis*] 33·4, Douglas Fir [*Pseudotsuga taxifolia*] 35·4, true Fir [*Abies* spp.] 29·7, and Engelmann Spruce [*Picea engelmanni*] 25·3.

[1120]. 33.36.1 : 33.53. FINLAY, R. H. **Timber preservation. Butt treatment.** *Bull. Minist. Agric. Lds., S. Rhod.* No. 1375 [1947?], pp. 10. *Repr.* from *Rhod. agric. J.* 43 (6), 1946 (516–24). P.R.

[1121]. 33.36.1 : 33.53. DELMAS. La technique de l'injection des bois. [**The technique of impregnating wood.**] *Les techniques du bois* 2, 1947 (126–35). [F.]

A review of the various methods of wood impregnation with particular reference to preservation of telegraph poles.

33.36.2. *Fireproofing*

[1122]. 33.36.2 : 33.31. MOON, C. F., and GOLLINSON-JONES, N. **Fire-resistant coating composition.** *U.S. Patent* No. 2,407,615, Sept. 10th, 1946. *Chem. Abstr.* 41, 1947 (602–3). P.R.

A fire-resisting composition which may be applied as an emulsion directly to textiles, wood, etc., or modified to produce plaster or board, is prepared from Na silicate, china clay, H_2SO_4, AcOH and H_2O.

[1123]. 33.36.2. **A study of fire resistant house paints made with chlorinated paraffin.** *Repr.* from *Amer. Paint J.* 31 (6c), 1946 (24–6). P.R.

Exterior house paints containing varying amounts of 70-per-cent. chlorinated paraffin were tested for working properties, appearance, storage characteristics and fire resistance. The most effective flame resistance was given by two coats of paint containing 50 per cent. of chlorinated paraffin based on total vehicle solids. Chlorinated paraffin does not appear to have a bad effect on the exterior durability of paints. *From author's summary.*

[1124]. 33.36.2. **Fire retardant paints for wood surfaces is N.Y. group report.** *Repr.* from *Amer. Paint J.* 31 (6–B), 1946 (8–30). P.R.

A report on research of a technical committee of the New York Paint and Varnish Production Club carried out in collaboration with a committee of the American Railway Engineering Association to find suitable methods of testing fire-retardant paints for wood. Experiments were made with modifications of the Fisher Burner, Schlyter and cabinet test methods, and a suitable modified testing cabinet was devised. Apparatus, test methods and results are described in full. [Cf. *For. Abstr.* 7 (No. 334).]

[1125]. 33.36.2 : 31.45 **Standard method of test for combustible properties of treated wood by the Crib test method. A.S.T.M. designation No. E160–46 (formerly designated C160). 1946.** 1946 Book of A.S.T.M. Standards including tentatives. Part II. pp. 1215–9. [American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.] P.R.

[1126]. 33.36.2. STEINER, A. J. **Fire hazard classification of building materials.** *Bull. Res. Underwriters' Lab., N.Y.* No. 32, 1944. pp. 35. D.S.I.R.

Equipment and method of testing the combustibility of certain materials, with some tests on treated and untreated specimens of Southern Yellow Pine, Douglas Fir, White Pine, Red Oak, plywood, felts and fabrics, are described. Tables and graphs give the test results, showing figures for the maximum flame spread, fuel contributed and smoke density. The test method provides a basis for comparing the fire-hazard characteristics of materials. The results are compared on a numerical basis with the performance of untreated timber, which is classified as 100, and with non-combustible asbestos-cement board, which is classified as 0.

[1127]. 33.36.2 : 33.8. VIRTALA, V. Puisista pellitetyistä palo-ovista. [**Tin-clad wooden fire doors.**] *Tied. Valt. tekn. TutkimLait.* No. 37, 1947. pp. 9 + [1]. [Fi.] P.R.

The inadequacy of the old type of asbestos- and tin-clad wooden fire door is demonstrated. Tests show that dry distillation of untreated wood in these doors begins at 250° C., whereas with fire-proofed wood it does not begin until 600° C.

33.36.3. *Seasoning. Drying*

See also *For. Abstr.* 9 (No. 959).

[1128]. 33.36.3. **Instructions in flat piling to take care of variations in local conditions and in species and sizes of stock.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1672 [*n.d.*]. pp. [1] + fig. P.R.

[1129]. 33.36.3 : 33.36.5. VILLIÈRE, A., and LEEUW, J. DE. Essais sur la rationalisation du séchage à l'air et ses conséquences au point de vue économique. [**Experiments in the rationalization of air seasoning and its economic consequences.**] *Les techniques du bois* 2, 1947 (32–4 + figs.). [F.]

An experiment was made in 1946 at the Laboratoire Central d'essais des Bois at Paris to determine the time necessary for air drying 27-mm. planks of Oak. The wood started at a moisture content of 60–80 per cent. and was piled in May; at the end of one month the moisture content was reduced to 30 per cent. and at the end of 80 days to 15 per cent. This was a small stack (3 cu.m.), and the authors consider that the time usually considered necessary for air seasoning can be much reduced by the use of small piles (say 10–15 cu.m.) instead of the large ones in general use.

During 1944 and 1945 tests were made on the air seasoning of 27-mm. planks of Beech and Oak to determine whether steaming had any effect in accelerating seasoning. It was found that there was no difference in the time taken by steamed and unsteamed planks.

[1130]. 33.36.3 : 07.7. BURKARD. Le séchoir standard. [**The standard seasoning kiln.**] *Les techniques du bois* 2, 1947 (35–7). [F.]

An account of the design and operation of a standard kiln developed during the war by a group of 8 manufacturers. It was planned for a production of 0·75 cu.m. per 10 hours' operation, with a view to use by small employers of labour.

[1131]. 33.36.3 : 07.7. Séchoirs à bois d'œuvre. [**Timber-seasoning kilns.**] *Les techniques du bois* 2, 1947 (38–40 + figs.). [F.]

Description of a prefabricated kiln, the 'Calocarbone Gohin', manufactured by the Fours Gohin company in several dimensions, capable of holding 5, 10, 15, or 20 cu.m. respectively. The advantages claimed for it are rapidity of delivery, assembly in 3 or 4 days, ease of dismantling or adding to it, minimum loss of heat, use of wood waste as fuel, semi-automatic regulation.

[1132]. 33.36.3 : 07.7. AUGIER. Réglage automatique des séchoirs à bois. [**Automatic regulation of wood-seasoning kilns.**] *Les techniques du bois* 2, 1947 (41–2). [F.]

[1133]. 33.36.3 : 07.7. JAVAL, R. Le séchoir 'Irradios'. [**The 'Irradios' wood-seasoning kiln.**] *Les techniques du bois* 2, 1947 (44–6 + figs.). [F.]

Description of a wood-seasoning device based on the recondensation of the moisture of a saturated gas on a surface colder than the gas. Because of the difference of the partial tensions of water vapour at different temperatures, the moisture in the interior of the wood is diffused from the warm regions to the colder ones. This phenomenon has already been made use of in high-frequency seasoning, but only by dint of using very high temperatures and considerable falls in temperature. In the present contrivance, developed at the laboratory of the French 'Dry-Beam' company, the evacuation of moisture is obtained by local falls in temperature, which take place successively right across the wood mass, from centre towards periphery, during the process of seasoning. The heating and chilling of the wood are conducted according to a predetermined rhythm, using unusual wave-lengths of irradiation, and the wood moves before the radiating bars with superposed continuous and sinusoidal motions.

Details of the operation of the process are given, with figures for different species and thicknesses of wood.

[1134]. 33.36.3 : 33.8 : 12.26–8. TORGESON, O. W. **Seasoning of Ohio 'Red' Willow artificial limb blanks.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1636, 1947. pp. 12 + tbls. + figs. P.R.

33.37. Distillation

[1135]. 33.37 (213) : 33.38. GACHOT. La pyrogénation du bois dans les pays tropicaux. [**Dry distillation of wood in tropical countries.**] *Les techniques du bois* 3, 1947 (54–9). [F.]

[1136]. 33.37 : 12.26–8 (66 : 67) : 33.38. BESSON, A. Essais au laboratoire de distillation sèche de quelques bois tropicaux. [**Laboratory experiments in the dry distillation of some tropical woods.**] *Les techniques du bois* 3, 1947 (49–53). [F.]

The results are given of the fractional distillation of the wood of some 40 species from French Equatorial and French West Africa, with similar data, for comparative purposes, for the commoner European species.

[1137]. 33.37 (560) : 09.4 : 33.38.1. HUS, S. Ormanlarimizdan Katran ve Zift çikarilmasi imkânlari. [**Possibilities of obtaining tar and pitch from Turkish forests.**] *Orman ve Av* 17 (6), 1945 (176–80). [Turk.]

Pre-war production of black and yellow tar [chiefly from *Pinus brutia*] was annually 2,830 quintals of tar and 470 of pitch; about 40,000 kg. of pitch was imported annually. Wood waste in Turkey is 150,000 cu.m. per annum; charcoal production is 51,000 tons (= 426,700 cu.m. of wood) per annum.

[1138]. 33.37 : 12.25 : 32.29.1. TIMM, A. L'utilisation de la souche de pin. [**The utilization of Pine stumps.**] *Les techniques du bois* 3, 1947 (39–40). [F.]

The author gives an account of operations in Corsica, where some 10,000 tons of stumps of *Pinus nigra* var. *corsicana* were extracted and distilled. The yield of these stumps was very high, being as follows per ton of stumps at 30 per cent. moisture content:—tar 250–300 kg., alcohol 80–100 kg., charcoal 230–250 kg., pyrolignite 200–250 kg., gas 240–100 kg. The use of cheddite is recommended for the

simultaneous extraction and splitting of stumps. A crew of 10 men, well organized, can easily obtain and stack 10 tons a day.

[1139]. 33.37 (44). DELAUNAY, R. Le méthanol de synthèse à partir du bois par le procédé de Lacotte: l'usine pilote de Decazeville (Aveyron). [**The Lacotte process for the manufacture of synthetic methanol from wood: the pilot plant at Decazeville (Aveyron).**] *Les techniques du bois* 3, 1947 (62–7 + figs.). [F.]

[1140]. 33.37. CEDERQUIST, K. N. (to Skånska Ättikfabriken Aktiebolag). **Hydrocarbons from wood and other lignocellulosic materials.** *Swed. Patent* No. 115,120, Oct. 9th, 1945. *Chem. Abstr.* 41, 1947 (850). P.R.

Synthetic hydrocarbons, such as acetylene, benzine, and oils, as well as alcohols and wood tar, are obtained by drying wood or other lignocellulosic material to below 10 per cent. of moisture, and then subjecting to dry distillation in a continuous process at such a temperature that the non-condensible gases contain at least 20 per cent. by volume of CH_4, whereupon the gases are treated by known processes to yield the desired hydrocarbons. The mixture of gases to which water may be added may be heated to a temperature above 500°, e.g. to 850–950° in the presence of a catalyst capable of converting a mixture of CH_4 and H_2O to H_2 and CO. The gaseous mixture can be treated to remove CO_2 before conversion.

[1141]. 33.37. BERGSTRÖM, H. O. V., and TROBECK, K. G. **Liquid fuels from wood or peat.** *Swed. Patent* No. 114,193, June 12th, 1945. *Chem. Abstr.* 41, 1947 (849). P.R.

Liquid fuels are obtained by impregnating wood or peat with alkali solution, heating under pressure to effect solution, evaporating the solution and dry-distilling the residue.

[1142]. 33.37. JONSSON, G. E. V. Trätjära som bränsle i tändkulemotorer. [**Wood tar as a fuel in hot-bulb engines.**] *Handl. Ing-VetenskAkad., Stockh.* No. 193, 1947. pp. 177. [Sw.e.] D.S.I.R.

[1143]. 33.37. BREMMER, G. P., and ÖMAN, E. **Distillation of wood tar.** *Swed. Patent* No. 114,462, July 10th, 1945. *Chem. Abstr.* 41, 1947 (887). P.R.

A mixture of 25 per cent. shale oil and 75 per cent. wood tar is distilled, and the fraction boiling above 250° is redistilled *in vacuo* while H_2 is bubbled through the liquid. The product boiling up to 300° is a stable high-viscosity and light-coloured lubricating oil.

[1144]. 33.37. LINDHE, J. H. O., and TAMRIN, K. A. (to Axel Axelson Johnson (trading as A. Johnson & Co.)) **Motor fuels by refining oils obtained from wood or wood tar.** *Swed. Patent* No. 113,024, Jan. 30th, 1945. *Chem. Abstr.* 41, 1947 (848). P.R.

Oils from wood or wood tar are distilled to remove lower-boiling constituents and extracted with a suitable hydrocarbon, e.g. benzine or white spirits, which is then removed from the extract. The latter is then mixed with the lower-boiling constituents and may be used as a motor fuel of low carbonizing characteristics and high calorific value. The hydrocarbon is returned to the process.

[1145]. 33.37 : 12.26–8. VILA, A., THOMAS, A., and DESALME, R. L'huile de goudron de bois feuillus; contribution à l'etude rationnelle des bois de feu. [**Tar oil from the wood of broad-leaved trees; contribution to the rational study of fuel woods.**] *J. Rech. Centre nat. Rech. sci.* No. 1, 1947 (49–56). [F.] D.S.I.R.

An account of experiments undertaken in France to investigate the possibilities of extracting from the tar of broad-leaved woods an oil which would be a suitable substitute for linseed oil. A method and equipment for preparing a wood tar rich in oil is described. The oil is extracted from the tar by a distillation process. Stabilization of the oil by partial oxidation, partial hydrogenation, esterification and acetylation was attempted, and these various methods are described and discussed. The oil was found to be suitable for use as an insecticide, or for mixing paints and varnishes. Residual tar from the distillation of the tar and oil can be used in making printer's ink, and solutions of the wood tar can be used as a dye for textiles.

[1146]. 33.37 (44). VILA, A. Contribution à l'utilisation rationnelle des bois de feu. [**Contribution to the rational utilization of firewood.**] *Les techniques du bois* 3, 1947 (71–6). [F.]

An account of methods of increasing the yield of tar from a semi-portable charcoal kiln, and extracting from it an industrial oil of numerous applications.

[1147]. 33.37. INGEBERG, H. C. M. **Absorption of organic acids from wood distillation gases.** *Norw. Patent* No. 71,112, Oct. 14th, 1946. *Chem. Abstr.* 41, 1947 (850). P.R.

Wood-distillation gases are absorbed in solid alkaline-earth carbonates at 120–200°, particularly at 150°, and aldehydes and ketones are obtained directly by distilling the product.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-gas Generators

See also *For. Abstr.* 9 (No. 976).

[1148]. 33.38 (54.3) : 92. SAGREIYA, K. P. **Cowdung economy *vis-à-vis* charcoal industry.** *Indian For.* 73 (5), 1947 (198–205).

It is estimated that something like 160,000 tons of charcoal are exported annually from the Central Provinces, mainly to Bombay and Delhi. The unlimited demand for charcoal and high prices ruling in Bombay and Delhi are leading to exploitation of forest reserves increasingly distant from the railheads, and to the over-exploitation of private forests. The author makes suggestions for amending the provincial laws so as to diminish the evils resulting from the present situation.

[1149]. 33.38. WORMSER, A. Procédé de houillification des végétaux (bois, déchets de bois et végétaux, etc.). **[Process for making coal from vegetable matter (wood, wood and plant waste, etc.).]** *Les techniques du bois* 3, 1947 (60–1). [F.]

The product here described is the result of successive applications of heat and pressure; it has a density equal to that of coal (1·15 to 1·5), calorific value of 6,000–6,800 calories, volatile substances 70–75 per cent., ignition temperature 350° C. (rather less than that of coal) and very low ash content. The yield of finished product is about 50 per cent. of matter treated at 40 per cent. moisture content; the thermal efficiency is about 70 per cent.

[1150]. 33.38.1 : 34.6 (431–5). SHERWOOD, P. W. **Activated-carbon production at I.G. Farbenindustrie, Leverkusen.** *FIAT Final Rep. Brit. Intell. Obj. Sub-comm.* No. 863, 1946. [i] + 5 + figs. P.R.

'Carboraffin', a type of activated carbon used for decolourizing was made from sawdust mixed to a paste with 65°-Baumé $ZnCl_2$ solution, using two parts of $ZnCl_2$ to one of sawdust. The paste was activated at approximately 700° C. in a gas furnace, cooled and leached, washed, ground wet and dried. 'Benzorbon', used to recover benzol from illuminating gas, was made in a similar fashion from a mixture of peat and sawdust.

[1151]. 33.38.2. CHAPOUX. Problèmes posés par l'utilisation du bois comme carburant pour la traction automobile dans les véhicules modernes. **[Problems presented by the utilization of wood as a fuel for internal combustion engines in modern vehicles.]** *Les techniques du bois* 3, 1947 (90–3). [F.]

An account of the transformation of surplus military vehicles to work on producer gas.

[1152]. 33.38.2. OBERTH, H. **Wood-burning jet unit.** AAF ATSC T-2 Translation 407. U.S. Department of Commerce. Office of the Publication Board. 1945. pp. 24. Bibliogr. Sci. industr. Rep. U.S. Dep. Comm. 1 (20), 1946 (1179). P.R.

[1153]. 33.38.3. KUSHNER, M. V. Drevesnougol'nyye brikety spetsial'nogo naznacheniya. **[Special charcoal briquettes.]** *Sborn. naŭchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946 (157–60). [Russ.]

The recommended method of making charcoal/wood-pitch briquettes is:—(1) The charcoal (hardwood or coniferous) is reduced to a particle size of 0·1–1·0 mm. (2) Water (4 parts) is added to dry pitch (6 parts), the two are heated to about 50° C. and mixed, first to a uniform emulsion and then with the charcoal (10 parts). (3) The resulting mass is allowed to stand for 48 hours, then formed in any suitable press and baked in retorts, without access to air, for about 12 hours and to a final temperature of 400–500° C., to remove water and volatile constituents. Under-baked briquettes will smoke, whereas over-baked ones are smokeless but difficult to ignite. The yield of briquettes is 40–55 per cent. of the wet mixture. Experimental briquettes made by this method (details are given of physical properties) were satisfactory. Their average calorific value was 7,130–7,284 Cal. per kg.

33.39. Manufacture of Sugar, Oils, Alcohol, and Miscellaneous Chemical Products from Wood

[1154]. 33.39 : 33.1 : 34.6. BRUS and FAUCOUNAU. L'hydrolyse des déchets de bois. **[Hydrolysis of wood waste.]** *Les techniques du bois* 2, 1947 (186–9). [F.]

The authors first review the Scholler and other processes and then give a fairly detailed account of their own process, which consists in the hydrolysis of the cellulose by sulphuric acid which is then neutralized by ammonia and so transformed into recoverable and commercially valuable products such as chloride, sulphate or phosphate of ammonia.

[1155]. 33.39 : 12.26–8 (66 : 67). SAVARD, J., REYGROBELLET, J., and LECLERCQ, A. Contribution à l'hydrolyse des bois coloniaux. **[The hydrolysis of colonial woods.]** *Les techniques du bois* 2, 1947 (190–6). [F.]

Wood of 40 species, mostly from French West and Equatorial Africa, were studied. The results tabulated are the density and hardness, total extractives, cellulose content, percentages of pentosans, hexoses and furfural, and for some species the content of fermentable sugars.

[1156]. 33.39 (74) : 34.26. ARIES, R. S. **Extractives from Northeastern woods. Extractives, a review of literature.** *Bull. Ntheast Wood Utiliz. Coun.* No. 9, 1946 (7–32). L.S.

A discussion of various types of extractive with tables giving a chemical analysis and the properties of some of the chief kinds.

[1157]. 33.39 (74) : 34.26. DOWNEY, A. H. **Extractives from Northeastern woods. Commercial production in the Northeast.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 9, 1946 (33–8). L.S.

[1158]. 33.39 : (74) : 12.25 : 34.26. ARIES, R. S. **Extractives from Northeastern woods. The economic extraction of essential oils.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 9, 1946 (39–55). L.S.

Conifer leaf oils can usually be extracted by steam distillation. A table gives average yields for various species. The collection of raw material for distillation, apparatus, procedure and costs of commercial production are discussed. Tables show the effects (if any) of variables in operating conditions, season of cutting, etc.

33.4. *Converted Structural Timber*

See also *For. Abstr.* 9 (No. 1005, 1016–7, 1175, 1177).

[1159]. 33.4 : 31.27. WICKETT, H. C. **Lateral stability of timber beams of uniform rectangular section.** *J. Instn. Engrs. Aust.* 18 (1/2), 1946 (19–26). D.S.I.R.

In the past, in the designing of timber beams, where a mathematical approach to the question of lateral stability has been made, it has often been assumed that the formulae deduced by various elasticians for neutral axis loading have applied to other forms of loading. It is shown that the effects of this error can be far from negligible. Curves are given enabling beams designed in Australian timber species to be readily checked for lateral stability, and tables from which curves for any species can be prepared are included. Numerical examples are worked out for common forms of loading. *Author's summary.*

[1160]. 33.4 : 38.2. **The Corry fabricated joist.** *Timb. & Plyw.* 92 (2393), 1947 (614, x). P.R.

An illustrated description of a built-up joist made by J. P. Corry & Co. Limited, Belfast from small scantlings. Up to 42 per cent. of of the timber necessary can be met by short offcuts of home-grown timber. An account of some strength tests made by the Belfast College of Technology is included.

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

See also *For. Abstr.* 9 (Nos. 944, 959, 1111, 1118–21).

[1161]. 33.51 (44). DOSMOND. Quelques vues sur le problème du boisage dans les mines de fer de l'est de la France. **[The problem of timbering in the iron mines of the East of France.]** *Les techniques du bois* 2, 1947 (111–14). [F.]

[1162]. 33.51 : 31.27. CRESTIN, F. Étude des qualités mécaniques recherchées pour les

bois de mines. Rôle possible des laboratoires. [**Study of the mechanical qualities required in mining timbers. The possible rôle of laboratories.**] *Les techniques du bois* 2, 1947 (98–102). [F.]

Cf. *For. Abstr.* 8 (No. 1288).

[1163]. 33.51 : 31.27 : 32.82 : 32.24. GUINIER, P.-H. Note sur l'influence possible des conditions de conservation et de la saison d'abatage sur les propriétés mécaniques des étais de mine. [**Note on the possible influence of storage conditions and felling season on the mechanical properties of pit props.**] *Les techniques du bois* 2, 1947 (103–4). [F.]

33.6. *Packing Boxes, Crates, etc.*

[1164]. 33.6. LUCA, J. A. DE. **The application of wood and fiber to industrial packing, with discussion.** *Trans. Amer. Soc. mech. Engrs.* 69 (2), 1947 (163–76). P.R.

Discusses the characteristic strength and weakness of several types of box and crate and the construction details influencing their serviceability. *From author's summary.*

[1165]. 33.6. MILLETT, R. S. **Packing for export.** *Mimeo. For. Prod. Lab., Can.* No. 125, 1947. pp. 12 + figs. P.R.

A summary of points to be considered in designing wooden and fibreboard containers for shipment. Species and quality of wood, design, nailing and strength-testing methods are discussed.

[1166]. 33.6. **Use of short boards in sheathing crates.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–7 [*n.d.*]. pp. [1]. P.R.

Tests at the Madison Forest Products Laboratory show that the use of short-length sheathing boards for crates is more economical than the use of full-length boards, while no loss in the strength and rigidity of the crates is incurred. Practical recommendations for their use are given.

33.8. *Other Manufactured Products*

See also *For. Abstr.* 9 (Nos. 888, 921, 1003, 1007–8, 1134, 1176).

[1167]. 33.8. BERTHAUME, M. Le bois et la construction aéronautique. [**Wood and aeroplane construction.**] *Les techniques du bois* 2, 1947 (115–20). [F.]

[1168]. 33.8 : 33.15.2. **Propellers from laminated wood billets.** *Mod. Plastics* 24 (8), 1947 (132–3). P.R.

[1169]. 33.8. Les bois dans la construction des navires. [**Wood in ship building.**] *Les techniques du bois* 2, 1947 (121–4). [F.]

[1170]. 33.8 : 31.42.11 : 12.25. **Ship and boat building.** *Rep. N.Z. For. Serv. 1945–6*, 1946 (35–6).

Investigations were made into the premature rotting of Kauri (*Agathis australis*) planking in a small ship after a very short period of service, two other older vessels being similarly affected. These instances emphasize that types of construction such as the 'three-skin' method should be avoided, since the middle skin (diagonal sheathing) is particularly subject to rotting when condensation water from an adjacent hold or fresh water from other sources penetrates to it. The sea-water permeates a short distance into the outer planking, and rot extending from the affected skin is not likely to be visible from the outside, nor is the ventilated surface of the inside sheathing likely to show signs of rot until it is far advanced. [Cf. *For. Abstr.* 9 (No. 933).]

[1171]. 33.8 : 33.15.2 : 31.27. LUXFORD, R. F., and KRONE, R. H. **Laminated, bolted, and solid keels for 50-foot navy motor launch compared for strength.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1625, 1946. pp. 11 + tbls. + figs. P.R.

[1172]. 33.8 (44). L'utilisation des bois indigènes pour la fabrication des planchettes pour crayons. [**The use of native woods for manufacture of pencil slats.**] *Les techniques du bois* 2, 1947 (125). [F.]

During the war, various home-grown woods were experimented with in France for the manufacture of pencil slats. The least unsatisfactory were Alder and Lime.

[1173]. 33.8 (68) : 31.0 **Substitute timbers.** *Rep. Dep. For. S. Afr. 1946*, 1947 (8).

As a result of inquiries in East and West Africa and tests at the Forest Products Institute at Pretoria, local woods can be recommended as follows—Yellowwood (*Podocarpus* spp.) and Marula (*Sclerocarya caffra*) for battery separators; Onionwood (*Cassipourea verticillata*) and Lemonwood (*Xymalos monospora*) for shoe heels; White Pear (*Apodytes dimidiata*) for

printers' woods; *Pinus pseudostrobus* and *P. montezumae* for pattern woods; and *Eucalyptus* spp. for springboards, handles and laminated butchers' blocks.

33.9. *Grading and Storage of Converted Timber*

[1174]. 33.91 (44) : 32.3 : 31.0. DUVAL, J. Le bois et la normalisation. **[Wood standards.]** *Les techniques du bois* 1, 1947 (89–96). [F.]

An account of the various standards issued by the Association Française de Normalisation, dealing with tests of physical and mechanical properties of wood, standards for particular purposes, mensuration, assortment, etc. [Cf. *For. Abstr.* 9 (Nos. 1330–1).]

[1175]. 33.91 (44) : 33.12. GIGOU, L. La menuiserie normalisée. **[Standardized joinery.]** *Courr. Norm.* 14 (73), 1947 (480–3). [F.] P.R.

A discussion of standards for doors and window-frames introduced in France since 1940.

[1176]. 33.91 : 33.8. BLONDOT, J. La normalisation des échelles en bois. **[The standardization of wooden ladders.]** *Courr. Norm.* 14 (73), 1947 (484–6). [F.] P.R.

[1177]. 33.91 (73) : 33.8. UNITED STATES. **Old growth Douglas Fir standard stock doors. (Third edition).** *Comm. Stand. U.S. Bur. Stand.* No. 73–45, 1945. pp. 37. P.R.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

[1178]. 34 (545). GHOSH, A. K. **Utilization of minor forest products, Patiala State.** *Indian For.* 73 (6), 1947 (273–5).

Includes a list of some 90 species of plants with an indication of the part used and the locality where available.

34.2. *Vegetable Products*

34.21. Fodder Grass and Grazing

[1179]. 34.21 (542). KANJILAL, P. C. **Final report on the second Makhdoompur *usar* experiment (of 1939). Comparison of effects of periodic and rotational grazing. (Silviculture Division experiment No. 6).** *Leafl. U.P. For. Dep.* No. 12, 1945. pp. 8.

[1180]. 34.21 (542). SETH, S. K. [compiler]. **Results of trials of indigenous and exotic fodder grasses under both agricultural and forest conditions, from 1939 to 1945.** *Leafl. U.P. For. Dep.* No. 14, 1946. pp. 18.

For all exotic and indigenous species tried, the outturn of dry forage per acre is greater under agricultural than under forest conditions. As a general rule, the local indigenous species of grasses are better able to sustain themselves between lines of trees in *taungya* plantations than are exotic species. Grasses can be propagated successfully only between widely spaced lines of light-crowned species of trees. *Bothriochloa intermedia* (sandhaur) and *Panicum maximum* (guinea grass) are the most promising indigenous and exotic species respectively.

[1181]. 34.21 (788) : 12.25. COSTELLO, D. F., and SCHWAN, H. E. **Conditions and trends on Ponderosa Pine ranges in Colorado.** U.S. Forest Service. [?1946.] pp. 33. [Rocky Mountain Forest and Range Experiment Station.]

[1182]. 34.21 : 65.7 : 57. **Density of grazed forests in relation to yields of wood and forage.** *Rep. Ia. agric. Exp. Sta. 1946*, 1946 (252).

A preliminary analysis has been made of 17 temporary sample plots established in 1943. The data show that on similar sites the more open stands contain trees that are shorter, larger in diameter and lower in quality than trees in more fully stocked stands. In very open stands containing large-crowned trees, diameter growth greatly exceeded that of small-crowned, open- or closed-stand trees. More rapid diameter growth tends to compensate for fewer and shorter trees and results in abnormally high volume growth for stands of any given basal area. Volume growth of wood per acre and forage-acre factor were inversely related.

34.24. Tanning Materials. Cork. Bark Products

See also *For. Abstr.* 9 (No. 976, 1077).

[1183]. 34.24 : 12.11.11 : 12.14.8. **Chemical composition and uses of bark.** *Rep.*

U.S. For. Prod. Lab., Madison No. *R*1666–5 [*n.d.*]. pp. 4 + tbls. P.R.

[1184]. 34.24 : 12.25 : 12.11.11. CRAM, K. K., EASTWOOD, J. A., KING, F. W., and SCHWARTZ, H. **Chemical composition of Western Red Cedar bark.** *Circ. For. Prod. Lab., Can.* No. 62, 1947. pp. [i] + 12. P.R.

Inner and outer bark fractions from Western Red Cedar were analysed by the usual methods applied to wood. With the exception of a higher lignin and higher 1-per-cent.-sodium-hydroxide-soluble content in outer bark, the two bark fractions show similar compositions. Pentosans are present to an extent of about 10 per cent. Part of these pentosans are easily extracted with 1-per-cent. sodium hydroxide but part are more resistant to solubilization even after treatment with 1-per-cent. hydrochloric-acid solution at 15 lb./sq. in. steam pressure. Pulping experiments on outer bark using 5-per-cent. sodium-hydroxide solution at 170° C. indicate the presence in the pulps obtained of lignin fractions resistant to solubilization. Pulp which was obtained in a yield of 33·6 per cent. contains about 74 per cent. glucose, 8·9 per cent. xylose, and a trace of mannose. The original solvent-extracted bark contains 37·3 per cent. glucose, 7·4 per cent. xylose, and smaller quantities of mannose and galactose. Approximately one-third of the total glucose present is in the form of hemicellulose material. *Authors' summary.* [Cf. *For. Abstr.* 6 (237).]

[1185]. 34.24 : 12.25. **Weyerhaeuser now operating bark processing plant.** *Paper Ind.* 29 (4), 1947 (489–90). P.R.

Commercial manufacture of cork flakes, short fibres, tissue powder and a cork-fibre-powder combination from the bark of Douglas Fir has been undertaken by Weyerhaeuser Timber Company, Longview, Washington. These materials have proved useful in the production of plywood glues, plastics, insecticides and soil conditioners and are being marketed under the trade name 'Silvacon'. [Cf. *For. Abstr.* 4 (183); 5 (51).]

[1186]. 34.24 : 12.26–8. Une matière tannante naturelle de complément: la racine de bruyère des Landes. [**An auxiliary natural tanstuff: the root of *Erica scoparia.***] *Les techniques du bois* 2, 1947 (197–9). [F.]

[1187]. 34.24 : 12.26–8 (574). MOROZOV, I. P. Kor'evye ivnyaki Zapadnoy Sibiri. [**Tanbark Willow stands of Western Siberia.**] *Nauchnŷ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 197–208. [Russ.]

A survey was made of Willows for tanbark in the region between Tamarsk (near Omsk), Krasnoyarsk and Alexandrovo, with a total area of Willow thickets of 359,200 ha. Data are included for *Salix alba, S. caprea, S. cinerea, S. dasyclados, S. nigricans, S. pentandra, S. phylicifolia, S. pyrolifolia, S, rossica, S. sibirica, S. triandra.* The yield of air-dry bark in kg. per ha. (calculated from sample-plot data) varied, with age and latitude, from 750 to 10,000 for *S. rossica*, 1,800 to 17,000 for *S. dasyclados*, 425 to 10,000 for *S. triandra*, 2,400 to 5,000 for *S. caprea* and 1,200 to 1,600 for *S. cinerea.* The mean tannin contents for bark of these species were respectively 7·77, 8·97, 7·52, 10·57, 12·59 per cent. Possibilities of exploitation are discussed.

[1188]. 34.24 : 33.36.3. DÉRIBÉRÉ, M. Le séchage du liège manufacturé par rayonnement infra rouge. [**Drying manufactured cork by infra-red rays.**] *Rev. int. Bois* 14 (117), 1947 (51–3). [F.]

34.25. Medicinal and Edible Plants

[1189]. 34.25 (669.9). GÓMEZ-MORENO, M. L. Notas y aclaraciones sobre las plantas llamadas 'Iboga' y 'Kinkeliba'. [**Notes on the plants known as 'Iboga' and 'Kinkeliba'.**] *Publ. Direcc. Agric. Terr. esp. Golfo Guinea* No. 7, 1943 (49–59). [Span.] I.I.E.

Notes on the botanical characters and medicinal properties of *Tabernanthe iboga, Cassia occidentalis*, and *Combretum micranthum.*

[1190]. 34.25 : 12.26–8. ROY, H. C. **Khair (Catechu) industry.** *Indian For.* 73 (6), 1947 (276–7).

An account of the native method of manufacturing Khair, a multiple-use extract from the wood of *Acacia catechu.*

[1191]. 34.25 : 12.26–8 (81). MACHADO, O. Pata de vaca. [***Bauhinia forficata* Link.**]. *Rev. flor., Rio de J.* 5 (1), 1946 (48–9). [Port.]

A woody species used in the treatment of diabetes.

[1192]. 34.25 : 12.26–8 : 12.11.11. MASSACHETOV, P. S. Alkaloidy v rasteniyach sem. Elaeagnaceae. [**Alkaloids in plants of the family Elaeagnaceae.**] *Zh. obshch. Khim.* 16 (4/5), 1946 (775–6). [Russ.e.] O.R.S.

[1193]. 34.25 : 12.26–8 : 21.12. WINTERS, H. F., LOUSTALOT, A. J., and CHILDERS, N. F. **Influence of temperature on growth and alkaloid content of *Cinchona* seedlings.** *Plant Physiol.* 22 (1), 1947 (42–50). [Federal Exp. Sta., U.S. Department of Agriculture, Mayaguez, Puerto Rico.] O.B.D.

C. pubescens seedlings grown at 70–80° F. had an average dry weight about twice that of plants grown at 60–70° F. and a similar trend in height, while those grown at 65–75° F. were intermediate. *C. ledgeriana* seedlings grew best in the medium temperature. The shoot/root ratio of the *C. pubescens* plants was not significantly affected by temperature but in *C. ledgeriana* the lower the temperature the greater the roots in proportion to the shoots.

High total alkaloids and quinine in *C. pubescens* roots and stems seemed to be associated with high temperature and vigorous growth. There was no consistent trend in the *C. ledgeriana* seedlings in regard to these constituents.

[1194]. 34.25 : 12.26–8 : 12.11.22. FERNIE, L. M. **The vegetative propagation of *Cinchona* by cuttings.** *E. Afr. agric. J.* 12 (4), 1947 (228–36). [East African Agricultural Research Institute, Amani.]

The advantages of vegetative propagation of *Cinchona* are discussed and its history outlined. The methods of striking root, leaf, axillary bud, hardwood stem cuttings and softwood stem cuttings are discussed. While all methods are possible, propagation by softwood stem cuttings (i.e. cuttings from the tips of shoots and branches still in active growth) is the most practicable and successful. *C. succirubra* roots easily, but it is desirable to obtain material from stems of suckers in preference to branches. Thin cuttings of current year's growth are best. The preparation of beds, shading, etc., are described. Rooting is claimed in about 3 weeks in Russia, elsewhere varying periods of 2–6 months are required. *From author's summary.*

[1195]. 34.25 : 12.26–8 : 34.26. CHEVALIER, A. **Sur le genre africano-brésilien *Lindackeria*** Presl., dont les graines renferment un beurre acide hydnocarpique. [**On the African and Brazilian genus *Lindackeria* Presl., the seeds of which produce an oil containing hydnocarpic acid.**] *Rev. int. Bot. appl. Agric. trop.* 27 (291/2), 1947 (1–5). [F.] P.R.

Four species of *Lindackeria* are described. *L. dentata* has a seed oil with a very high hydnocarpic-acid content which could be used in the treatment of leprosy, as are seed oils of other Flacourtiaceae.

[1196]. 34.25 : 12.25. NATADZE, G. M. and PEKHTEREVA, S. I. [**A method for adsorbing resinous substances from conifer needles.**] *Gigiena* 10 (9), 1945 (53–4) [Russ.?] Chem. Abstr. 41, 1947 (2210). P.R.

The conifer-needle extracts are important sources of vitamin C in Russia. Gumbrin, askanite and gelatinized askanite were examined as tar adsorbents for the vitamin-containing resins. Conifer needles were boiled for 15 minutes in 5 volumes of water acidified with HCl, let stand for several hours and filtered through cheesecloth. Portions of the filtrate were shaken with 4 per cent. of the adsorbent for 15 minutes and filtered through a Büchner funnel containing a layer of diatomaceous earth on top of the filter paper. Askanite gave a turbid, green filtrate tasting almost like the untreated extract. Gelatinized askanite and gumbrin gave clear, transparent, and yellowish-green filtrates, almost free from bitter flavour. Vitamin C activity of all the filtrates was 20–25 per cent. lower than that of the untreated extract. Addition of 2 per cent. by weight of adsorbent did not give good results.

[1197]. 34.25 (470) : 47. AL'BENSKI, A. V. List'ya derev'ev i kustarnikov kak istochnik vitamina C. [**Leaves of trees and shrubs as a source of vitamin C.**] *Nauchnŷ Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 185–8. [Russ.]

Data on the ascorbic-acid content of leaves of woody species are given by family and species. Those promising for industrial vitamin production (containing not less than 300 mg. of ascorbic acid per 100 g. of fresh leaves) are:—*Juglans cinerea, J. mandshurica, J. nigra* and *J. regia* (also the soft green fruit); *Pyrus malus* and 3 more species of Apple; Siberian Apricot [*Prunus sibirica*]; *Rosa pomifera, R. cinnamomea; Sorbus aucuparia; Amorpha* sp.; *Robinia*

pseudoacacia; *Gleditsia* sp.; *Euonymus verrucosa*; *Acer ginnala*, *A. saccharinum*; *Tilia parvifolia*; *Sambucus racemosa* and *S. nigra*.

In an experiment on the effects of defoliation, half of the foliage (alternate leaves) was removed from 14 seven-year-old plants of *Juglans regia* on June 20th, 1942; in the autumn of that year the mean height of stripped plants was 59 cm. as compared with 65 cm. for controls.

It is concluded that one-third of the foliage can probably be removed without loss of increment. The terminal shoot should not be stripped.

[1198]. 34.25 (576). ZEPKOVA, G. A. **Concentration of vitamin C in certain plant species of Central Asia.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 48 (9), 1945 (655–8). [E.] [The Central Asia University.] O.R.S.

The highest content of vitamin C was observed in members of the families Rosaceae and Papilionaceae. *Juniperus semiglobosa* and *Juglans regia* showed a high content of ascorbic acid. In fruits of *Rosa* sp. the daily concentration of vitamin C was highest at noon. At the period of fructification the ascorbic-acid content of the leaves of *Rosa* sp. and *Malus pumila* was very low, probably due to the migration of the substance from the leaves to the fruits.

[1199]. 34.25 : 12.26–8 : 12.14.5. KARDO-SYSOEVA, E. K. **[Use of Walnut leaves in concentrates of vitamin C and carotene.]** *Pishchev. Prom. SSSR* No. 2, 1945 (15–20). [Russ.?] *Chem. Abstr.* 40, 1946 (3231). P.R.

Walnut leaves from Bostandyks contain 800–1,300 mg. per cent. ascorbic acid and over 30 mg. per cent. carotene, calculated on raw weight. Vitamin potency appears in April and begins to decrease in early autumn. The content of carotene in sun-dried, fumigated leaves was 20–25 and in shade-dried unfumigated leaves 40–50 mg. per cent. The loss of ascorbic acid in freshly severed leaves is about 10 per cent. in 10 hours, 40 per cent. in 2 days. Dried leaves when sealed keep well; unsealed, in humid weather, they may lose 30 per cent. of their initial ascorbic-acid content in 3 months. Wet sulphiting can be effected by fumigating wet leaves with SO_2 or by soaking fresh leaves in aqueous H_2SO_3. From trials it appears that commercial use of Walnut leaves for making vitamin concentrates is feasible. Syrups of ascorbic acid can be made with 150–650 human doses per kg. Tables show losses of ascorbic acid and carotene after dry and wet sulphiting and after drying under various conditions.

[1200]. 34.25 : 12.26–8 : 12.14.5. KARAPET'YAN, SH. A. **[Vitamin C concentrate from Walnut leaves.]** *Pishchev. Prom. SSSR* No. 2, 1945 (35–8). [Russ.?] *Chem. Abstr.* 40, 1946 (3231). P.R.

The vitamin-C content of sulphited Walnut leaves suffers almost no loss in rapid drying at 100–110° C. For storage the leaves are best baled to a bulk of 1,000–1,500 cc./kg. Juice pressed from sulphited Walnut leaves contains up to 70 per cent. of the initial vitamin C. A second pressing may raise the yield to 80–85 per cent.; aqueous extraction may yield 90–93 per cent. The pressed juice can be purified with active carbon (vitamin-C loss 5–15 per cent.), then evaporated in vacuum to a concentration of 5,000 mg. per cent. vitamin C. Walnut leaves rise from about 350 to 1,000 mg. per cent. vitamin C from April to early June, then drop to about 400 mg. per cent. in late summer.

[1201]. 34.25 : 12.11.11. KISSELEVA, E. F. **A contribution to the knowledge of chemical relations between plants and animals.** *C.R. (Doklady) Acad. Sci. U.R.S.S.* 49 (9), 1945 (682–3). [E.] O.R.S.

Investigations on the insecticidal value of volatile products of *Padus racemosa*, *Populus alba*, *Acer negundo*, *Betula verrucosa*, *Sorbus aucuparia*, and other woody species.

34.26. Resin. Turpentine. Oils. Gums. Rubber

See also *For. Abstr.* 9 (Nos. 1066, 1195).

[1202]. 34.26 : 07.7. BOURKE, N., and DORMAN, K. W. **Florida spray gun for Pine tree gum flow stimulation.** *Bull. Fla. Engng. industr. Exp. Sta.* No. 10, 1946. pp. 36. P.R.

The Florida spray gun (U.S. Patent No. 2,394,424) was evolved after experiments for spraying small amounts of sulphuric acid on freshened surfaces during resin-tapping. The gun consists of an acid container of glass or plastic; the operator blows down a flexible tube into the container, thus forcing the acid up into

the nozzle and at the same time supplying the jet of air necessary to convert the stream of acid into a spray by atomization. Results for the seasons 1944 and 1945 were satisfactory. The gun is light and can be manipulated with one hand. The article gives, as appendices, a history of the development of chemical stimulation of resin and a resumé of other devices used for applying acid.

[1203]. 34.26 : 12.25 : 44.3. TRUE, R. P., and SMUCKER, M. M. **Symptoms induced at standardized wounds by fungi isolated from dry turpentine faces.** *Abstr.* in *Phytopathology* 37 (6), 1947 (437).

Diplodia pinea, *Gloeotulasnella pinicola* and *Ceratostomella ips* produced pitch soak and dry face (cessation of normal gum flow after wounding) at cambium-depth inoculated wounds in Slash Pine (*Pinus caribaea*). *Diplodia natalensis* induced considerable pitch soak but little dry face. No notable symptoms resulted from inoculating wounds with species of *Cytospora*, *Trichoderma*, *Penicillium*, *Geotrichum*, *Schizophyllum*, *Stereum*, and seven undetermined fungi. The three dry-face fungi and possibly also *Diplodia natalensis* are considered capable of invading uninfected turpentine faces. The other fungi tested are regarded as secondary invaders usually incapable of infecting healthy faces. Gum-yield and pitch-soak measurements showed that temporary gum-flow stimulation and extensive pitch-soak symptoms usually preceded the dry-face condition. Symptoms were most pronounced following inoculations with *Diplodia pinea*. Wound response differences were largely attributable to the different fungi tested, but individual tree characteristics also determined in part the type and severity of symptoms. Present experimental evidence indicates that certain fungi may often play a primary rôle in inducing dry face, a major source of loss to the naval stores industry.

[1204]. 34.26 : 07.7. **Continuous process for flash-distillation of Pine gum to produce turpentine and rosin.** *Chem. & Engng. News* 25 (7), 1947 (440). D.S.I.R.

The continuous distillation process developed at the Naval Stores Station, Bureau of Agricultural and Industrial Chemistry, Olustee, Fla. is faster and cheaper than the usual batch method.

The equipment consists of a preheater, flash chamber, stripping column, and condenser. The cleaned Pine gum is pumped through the preheater where its temperature is raised by steam to 345–350° F. Entering the flash chamber, the gum loses 80 per cent. of its turpentine, which passes out of the top to the condenser and cooling coils. The resin then flows down the stripping column, where it meets an ascending current of steam which removes the last of the turpentine.

Steam consumption in the new still is said to average about 0·5 lb. per lb. of gum—less than two-thirds of that of the batch still. Cost of a full-size unit is estimated at 25 per cent. less than that of the batch still.

[1205]. 34.26 : 12.25. RUMMELSBURG, A. L. (to Hercules Powder Co.). **Pine-wood resin of increased melting point.** *U.S. Patent* No. 2,417,180, Mar. 11th, 1947. *Chem. Abstr.* 41, 1947 (3308). P.R.

Pine-wood resins containing from about 30 per cent. to about 95 per cent. of petroleum-hydrocarbon-insoluble material are heated with a boric-acid compound to give a resinous product with a higher melting point and less tendency to cold flow and to sintering in the pulverized state.

[1206]. 34.26 : 33.32.4 LANE, F. H. (to Hercules Powder Co.). **Zinc resinate.** *Canad. Patent* No. 439,774, Feb. 18th, 1947. *Chem. Abstr.* 41, 1947 (3979). P.R.

A clear homogeneous resinate containing about 10–23 per cent. by weight of Zn is prepared by fusing a polymerized rosin with Zn acetate at about 200–330° F.

[1207]. 34.26 : 33.32.4. ELLIOTT, H. A. (to Hercules Powder Co.). **Manganese resinates.** *Canad. Patent* No. 439,776, Feb. 18th, 1947. *Chem. Abstr.* 41, 1947 (3979). P.R.

Examples are given for preparing a homogeneous fused salt of a natural rosin and Mn containing about 3–9 per cent. Mn and about 0·5–2·0 per cent. Ca by weight. The resinates may be used as driers in paints, etc., or as plastic resins in conjunction with various cellulose derivatives such as ethylcellulose.

[1208]. 34.26 : 12.26–8 : 31.3. **Wallaba wood resin.** *Rep. colon. Res., Lond. 1946–7*, 1947 (39).

Experiments have been made at the Road Research Laboratory (D.S.I.R.) on the possibility of using resin from wood of *Eperua falcata* in soil stabilization [cf. *For. Abstr.* 7 (No. 1895)]. Whilst it would appear that the resin exerts some waterproofing action when mixed with loamy soil in the proportion of 4 per cent. by weight, the action is not so marked as that obtained by Manila copal resin, and neither of these resins is as efficacious as the proprietary stabilizing agent known as 'Vinsol'. It is proposed to try further experiments with the calcium salts of the resin and also with its benzoyl derivative. Experiments being made at the Forest Products Laboratory, Princes Risborough, on the chemistry of the resin, suggest that it is related chemically to lignin, with possibly a somewhat less complex structure. On destructive distillation at a comparatively low temperature it yields a residual coke which may be of use in the metallurgical industry.

[1209]. 34.26 (73). SIEVERS, A. F. **The production of minor essential oils in the United States.** *Econ. Bot.* 1 (2), 1947 (148–60).

Includes accounts of the distillation of the oils of Cedarwood (*Juniperus virginiana*), Sassafras (*Sassafras albidum*), Cedar leaf (*Thuja occidentalis*), Sweet Birch (*Betula lenta*), Witch-hazel (*Hamamelis virginiana*). [Cf. *For. Abstr.* 9 (No. 1158).]

[1210]. 34.26 : 12.25 : 32.29.2. [RISI, [J.] and BRÛLÉ, [M.].] **Utilization of conifer branches.** *Perfum. essent. Oil Rec.* 37 (3), 1946 (78–9). *Abstr.* from *Amer. Perfum.* O.B.

A table is included showing the physico-chemical properties of the needle oils of *Thuja occidentalis*, *Pinus strobus*, *Abies balsamea*, *Picea mariana*, and *Tsuga canadensis*.

[1211]. 34.26 : 12.25 (47) : 12.11.11. [SOKOLNIKOV.] **Russian Juniper oils.** *Perfum. essent. Oil Rec.* 37 (10), 1946 (275). *Abstr.* from *Drug Cosmetic Ind.* O.B.

Comparative data on the physical constants of the oils of *Juniperus semiglobosa*, *J. turkestanica*, *J. polycarpus* and *J. excelsa*. Alpha-pinene is the principal constituent of these oils, but cedrene and cedrol are also present.

[1212]. 34.26 : 12.26–8 (548) : 12.11.11. SUBBA RAO, M. N., and NAGESA RAO, M. **Mysore Linaloe leaf oil.** *Perfum. essent. Oil Rec.* 37 (10), 1946 (312). O.B.

The physical and chemical characteristics of the leaf oil of the Mexican species *Bursera delphiciana*, grown in Mysore, are tabulated and compared with data for oil obtained from its berries. The leaf oil has a sweet tenacious odour. Its relative richness in the ester content (containing more than 1½ times as much as the berries' oil) makes it more useful for perfumes.

[1213]. 34.26 : 12.26–8 (696). COSGROVE, D. J., and ISLIP, H. T. **Cinnamon leaf oil from Seychelles.** *Bull. imp. Inst.* 44 (4), 1946 (287–90).

Seychelles Cinnamon-leaf oil, which is used mainly for the production of vanillin, showed an improvement on the odour of the straight oil when fractionally distilled, but fractionation on a commercial scale is not justified.

[1214]. 34.26 : 12.26–8 (94). PENFOLD, A. R., and MORRISON, F. R. **Essential oils of the Australian flora. Post-war investigations at the Sydney Technological Museum.** *Perfum. essent. Oil Rec.* 37 (7), 1946 (172–3). O.B.

Experiments are being carried out with *Eucalyptus* spp. in order to improve, by selection, such characteristics as vigour of growth, ability to recover rapidly after cutting, oil yield, and the chemical composition of the oil, and to determine optimum planting distances, cutting frequencies, manurial treatments, etc.

[1215]. 34.26 : 12.26–8 : 34.27. NOVOTNY, E. E. (to Durite Plastics, Inc.). **Manufacture of synthetic resins [from Cashew nutshell liquid.]** *U.S. Patent* No. 2,341,115, Feb. 8th, 1944. *Brit. Abstr.* BII, 1947 (27). P.R.

Cashew nutshell liquid is heated with a permanently fusible phenolic resin, e.g. phenol formaldehyde or phenol furfuraldehyde, gum accroides, or dragon's blood, that can, *per se*, react with hardening agents containing reactive CH_2 groups, e.g. paraldehyde, $(CH_2)_6N_4$, or a $COMe_2$–CH_2O reaction product, until a sample withdrawn from the reaction mixture and cooled is homogeneous and grindably hard. The hardening agent is then incorporated. The heating may be carried out in presence of mineral or organic acid catalysts.

[1216]. 34.26 : 12.26–8 : 34.27. FREUND, E. H., and MAHLER, P. (to General Foods Corporation). **Treatment and utilization of Cashew nutshell liquid.** *U.S. Patent* No. 2,415,347, Feb. 4th, 1947. *Chem. Abstr.* 41, 1947 (2594). P.R.

Methods of preparing from Cashew nutshell liquid, water-soluble products which are useful as detergents, wetting agents or tanning agents.

[1217]. 34.26 : 12.26–8 (73). BLACKMON, G. H. **Tung oil—a gift of China.** *Econ. Bot.* 1 (2), 1947 (161–75).

An account of the introduction of Tung cultivation into the United States, with uses of the oil, silvicultural methods, insect and fungal pests, varieties to be planted, etc.

[1218]. 34.26 : 12.26–8 : 34.27. **Candlenut—a new drying oil.** *Paint Mfr.* 16 (10), 1946 (372). D.S.I.R.

Investigations by a firm in Fiji have proved the suitability of Candlenut oil (*Aleurites moluccana*) as a drying oil in the paint industry. Cobalt resinate in mineral turpentine was added to the oil, and when allowed to dry overnight on glass and tinplate at 65° F., formed a firm, smooth and clear film. When heated at 500° C. the oil thickened in the usual way by polymerization, but did not coagulate as does Tung oil. The properties of the oil are tabulated. Production of the oil is expected to begin soon. [Cf. *For. Abstr.* 8 (No. 2665).]

[1219]. 34.26 : 12.26–8 : 34.27. HILL, A. G. **A note on *Allanblackia stuhlmannii* Engl.** *E. Afr. agric. J.* 12 (4), 1947 (210–1).

This tree occurs in great numbers in the evergreen, mountain forests of Tanganyika. Notes are given on methods of extracting the fat from the kernels of its seed, and a comparison is made of its physical and chemical properties with those of the fat from seeds of *A. floribunda*, a Gold Coast species.

[1220]. 34.26 : 12.26–8 : 34.27. PLOUVIER, V. Sur l'huile des graines de *Magnolia macrophylla* Michx. (Magnoliacée). [**On the oil of the seeds of *Magnolia macrophylla*.**] *C.R. Acad. Sci., Paris* 222 (17), 1946 (1009–11). [F.] D.S.I.R.

[1221]. 34.26 : 12.26–8. EGLER, F. E. **The rôle of botanical research in the chicle industry.** *Econ. Bot.* 1 (2), 1947 (188–209).

A fairly comprehensive account of Sapodilla (*Achras zapota*), its habitat, the methods of collecting chicle, the organization of the industry, the habits of the chiclero, the research already done, and an outline of research that needs doing, particularly on the ecology of the Sapodilla forest.

[1222]. 34.26 : 12.26–8 : 23.52. NOSTI, J. La utilization de *Hevea* empleados como arboles de sombra. [**The utilization of *Hevea* spp. used as shade trees.**] *Publ. Direcc. Agric. Terr. esp. Golfo Guinea* No. 7, 1943 (7–25 + plates). [Span.] I.I.E.

Hevea is not regularly planted for rubber in Fernando Po, but has been widely used for shade in Cacao plantations. Leguminous trees, are now preferred to *Hevea* as shade. The requirements and method of tapping *Hevea* are discussed.

34.27. Seeds. Fruits. Leaf Fodder

[1223]. 34.27. MELVILLE, R. **The nutritive value of nuts.** *Chem. & Ind.* No. 22, 1947 (304–6). P.R.

The article contains tables showing the starch, fat, protein and vitamin content of a large variety of nuts, under which heading are included a number of tree fruits and seeds.

[1224]. 34.27 : 12.26–8 (478 : 473). MININ, D. D. Resursy pishchevogo syr'ya v dubovykh nasazhdeniyakh. [**Resources of raw material for food in Oak stands.**] *Nauchny Otchet VNIALMI za 1941–1942g.* Sel'khozgiz, Moscow. 1946. pp. 189–96. [Russ.]

Acorn crops (*Quercus robur*) for the Tartar and Mordvinian A.S.S.R's. together with Kuibyshev Province are estimated at 11,099 metric tons in a poor mast year, 28,894 in a medium and 139,928 in an abundant mast year.

[1225]. 34.27 : 12.26–8 : 12.11.11. ESKOLA, S., and IVASKA, S. **Mountain Ash (*Sorbus aucuparia*) berry juice.** *Suom. Kem.* 19B, 1946 (26–30). *Brit. Abstr.* AIII 1947 (187). D.S.I.R.

Analyses are recorded for 14 samples of ripe Finnish Rowan berries.

[1226]. 34.27 (728.1). STANDLEY, P. C., and STEYERMARK, J. A. **Flora of Guatemala. V.** *Fieldiana (Bot.)* 24 (5), 1946. pp. v + 502. *Abstr.* in *Herbage Abstr.* 17 (3), 1947 [No. 1246].

Quotes verbatim extracts from the original on the fodder value of many species of trees and shrubs.

34.28. Bamboos. Heather

See also *For. Abstr.* 9 (No. 1186).

[1227]. 34.28 : 12.29 (63) : 38.2. PAOLONI and ALBERTONI. Sui cementi armati con barre di bambu. [**Concrete reinforced with Bamboo rods.**] In *Opere per l'organizzazione civile in Africa orientale italiana*, [1939]. pp. 161–71. [It.] X.

After summarizing the results of researches conducted at Stuttgart by Professor Graf, the authors give an account of experiments made in Abyssinia in 1937. The principal species of Bamboo in that country is *Arundinaria alpina*, of which there are some 10,000 ha. with an average density of 7,000–15,000 culms per ha. It was found that culms cut immediately after the rainy season were decidedly superior in strength and durability to those cut at other times. Of various preservative treatments tested, the most satisfactory was 'bakelization', i.e. a cold-bath treatment in a phenol-formaldehyde mixture with the addition of a catalyst to promote polymerization; this had the additional advantage of increasing mechanical strength of the Bamboo. Experiments made to test adhesion to concrete and reactions to thermal variation, showed that—(1) There was no natural adhesion between air-dried Bamboo and concrete, and test blocks made with Bamboo of large diameters were apt to split in the longitudinal direction of the Bamboo. (2) When the Bamboos were soaked in water before using, adhesion was at first notably good, but as the Bamboo shrunk adhesion was considerably reduced. (3) Specimens of concrete reinforced with varnished Bamboos, either whole or split, had a constant adhesive strength of 3–4 kg./sq. cm. (4) Specimens reinforced with 'bakelized' or vulcanized Bamboos had an average adhesive strength of 4–5 kg./sq. cm. and often much higher, resin-base treatments being particularly good. A number of structures in Bamboo-reinforced cement were erected to test the effect of the great variations in temperature experienced in Abyssina (30° C. and more) on the adhesion of the two materials, and it was demonstrated that such variations had no apparent effect in this respect. It is concluded that, although Bamboo cannot compete with iron, yet for rustic and colonial structures Bamboo-reinforced concrete might prove a valuable substitute.

35. SALE AND DISPOSAL OF FOREST PRODUCTS. TIMBER TRADE

[1228]. 35 (213). TERVER, P. Le commerce des bois tropicaux: (1) Exposé du problème. [**The tropical timber trade: (1) Statement of the problem.**] *Bois For. Trop.* 1 (1), 1947 (55–60). [F.]

The first and introductory article of a series by the technical adviser on forests, to the French Colonial Ministry, dealing mainly with questions of international demand and supply.

[1229]. 35 (410) : 12.25 : 98. DONNELLY, G. V. **Softwood review.** *Timb. & Plyw.* Annual Special Number, 1946 (22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44). P.R.

A review of the softwood trade in Great Britain between 1941 and 1946.

[1230]. 35 (52) : 98.1. BERRY, R. M., GROBER, S., and VARNEY, R. M. **A survey of timber control in Japan since 1941.** *Rep. Brit. Intell. Obj. Sub-comm.* No. BIOS/JAP/PR/838, 1946. pp. 63.

[1231]. 35 (595). EDWARDS, J. P. **Malayan timber for export.** Malayan Union Govt. Press, Kuala Lumpur. 1947. pp. 4. [5th British Empire Forestry Conference, Great Britain, 1947.]

The history of the Malayan timber export trade is sketched and the factors limiting the volume of the trade with high-class markets, particularly the United Kingdom, are discussed. Some suggestions for overcoming the difficulties are put forward.

[1232]. 35 (73) : 98.1. MULLER, J. L., and BOARDMAN, K. S. **Lumber industry report.** U.S. Department of Commerce, Washington, D.C. March, 1947. pp. 23.

This report, issued quarterly by the Forest Production Section of the U.S. Department of Commerce, gives a summary of timber prices, consumption and distribution in the U.S. by regions.

[1233]. 35 (97) : 98. **Report of the committee on timber supply.** In *Fifth British*

Empire Forestry Conference, Great Britain, 1947: *Summary Report*. 1947 (51–4). H.M. Stationery Office, London.

The Conference adopted the report of this committee. It was satisfied that there will be a shortage of forest products, particularly of sawtimber, for an indeterminate period and certainly until the devastation caused by the war has been repaired. The Conference directs the attention of the Governments of the Commonwealth to the committee's recommendations, and notably to the following:— (1) That a considerable all-round and immediate effort in timber production by all members of the Commonwealth is necessary if the Commonwealth is to play its part in restoring the general level of internal and world prosperity. (2) That regulated overcutting during the emergency period is necessary and justified, but Governments of the Commonwealth shall pay adequate attention to forest protection and later correction of the overcut by working-plan revision. (3) That priority in allocation of logs should go to production of sawtimber, poles, props and plywood; and every effort should be made to service other forest-products industries with smaller-sized material and utilizable waste. Further research to this end by forest products laboratories is an urgent requirement. (4) That attention should be paid to the possible increase in use of timber derived from tree species now considered of secondary importance, both for the purpose of alleviating current shortages and to provide for more economic working of mixed forests. (5) That a better understanding between producers and consumers and a revision of specifications would lead to closer utilization. This could be facilitated by personal contacts and through visits and inspections.

38. CONSTRUCTIONAL WORKS. ENGINEERING

38.2. *Building Construction. Foundations and Superstructures*

See also *For. Abstr.* 9 (Nos. 1016–7, 1227).

[1234]. 38.2. GAUTHIER, P. Les économies de matière dans la charpente en bois. **[Economizing material in wood framework.]** *Les techniques du bois* 2, 1947 (69–71). **[F.]**

[1235]. 38.2. LIMAYE, V. D. **Detailed design of timber roof trusses made with wooden disc dowel joints.** *Indian For. Bull. (n.s.) Utilization* No. 123, 1944. pp. 17 + plates.

[1236]. 38.2 : 33.15.2 : 31.27. FREAS, A. D. **Guides to improved framed walls for houses.** *Repr.* from *Engng. News-Rec.* Oct. 17th, 1946 (117–20). P.R.

Strength tests on wall panels with wooden frames showed the superiority of glued plywood sheathing over other types, diagonal sheathing over horizontal, and let-in braces over herringbone and cut-in braces. The addition of siding to a sheathed wall improves its strength. For panels with no openings, wood lath and plaster gives greater rigidity than braced walls with a timber sheathing. *From author's summary.*

[1237]. 38.2 : 31.37. TRAYER, G. W. **The rigidity and strength of frame walls.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*896 (rev.), 1946. pp. 11 + tbls. + figs. P.R.

Horizontally and diagonally sheathed and braced wood panels, and wood lath and plaster panels were constructed, both with and without openings, about the size of a normal room. These panels were then tested in order to find the amount of end thrust which various types of wall construction will withstand. Plaster on wood laths gives all the rigidity necessary for most purposes under normal conditions, but in violent winds or earthquakes the rigidity of the sheathing is most important. Diagonal or well braced horizontal sheathing gives far more rigidity than horizontal sheathing without bracing. A comparison of fibreboard with diagonal wood sheathing was also made. Results of all tests are given in detail.

[1238]. 38.2 : 31.27. **New formula developed for eccentric or moment resisting joints (split ring connectors).** *Timely Timb. Topics* No. 9, 1947. pp. 4. P.R.

[1239]. 38.2 : 31.27 : 33.12. CRANDELL, F. J. **Strength of nailed joints.** Liberty Mutual Research Laboratory, Boston, Mass. [*n.d.*] pp. 22 + [1]. P.R.

Includes tables (the result of experiments) of the number and size of nails necessary to support various loads in different types of wood.

[1240]. 38.2. Varmboning och ventilation av skogsstall: förutsättningar för en god hästvård under skogsarbetet. **[Heat insulation and ventilation of forest stables: conditions for proper care of horses in forest work.]** *Skogsägaren* 20 (12), 1944 (281–6). [Sw.]

38.3. *Road and Bridge Construction*

See also *For. Abstr.* 9 (Nos. 1016-7).

[1241]. 38 3. RAFFAELE, S. Le strade forestali. **[Forest roads.]** *Riv. for. ital.* 2 (11/12), 1940 (5–13). [It.]

Contains an analysis of the cost of constructing forest roads and a comparison of transport costs by road and by cableway in mountain forest.

[1242]. 38.3 : 07.7. ROMSON, B. Skogsvägsbrytning med tractor. **[Forest road building with a [bulldozer] tractor.]** *Skogen* 31 (13; 14), 1944 (201–4; 218–9). [Sw.]

Account of a Swedish trial of 1943, with notes on technique and the results of a time study of the operations.

[1243]. 38.3. VALETTE. L'emploi du bois dans la reconstruction des ouvrages d'art de la S.N.C.F.: Les palées d'ouvrages provisoires; les cintres. **[The use of timber in the reconstruction of the engineering works of the S.N.C.F.: the piers of temporary works; centering.]** *Les techniques du bois* 2, 1947 (72–5 + plates). [F.]

38.6. *Drainage*

[1244]. 38.62 : 56.1 (471). LEVIN, V. I. K voprosu o priroste drevostoev posle osushki ploshchadey na severe. **[The increment of stands after drainage operations in northern Russia.]** *Sbornik. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 149–56. [Russ.]

Four permanent sample plots (two in the *Piceetum rivulare* type, and one each in the *Piceetum hylocomiosum* and the *Pinetum cariceto-sphagnosum* [?] types; all in very uneven-aged stands) were laid out in 1941 on an extensive area in the Vozhegod forest district where drains had been cut in 1911–13 but were subsequently neglected. This area, formerly bog or under stands of quality class V*a*, now carries stands of quality class IV with volumes of 50–180 cu.m./ha. Measurements are given of individual trees on the most striking of the plots, which had carried stunted Pine with sedges and *Sphagnum* before drainage but improved after treatment to Pine/Spruce/Birch of quality class IV with a stocking (at average age 70, diameter 16·1 cm. and height 14 m.) of 147 cu.m./ha., and a ground flora of *Vaccinium* spp., *Hypnum schreberi*, *Polytrichum* and *Sphagnum*.

The best growth after drainage was shown by four of the trees in the zone 0–10 m. from the drain, these having a current annual height increment of 45 cm. (equal to that of the highest quality classes) at 60–70 years. One of these reacted in d.b.h. increment from the 3rd year after drainage, and reached a peak of 9·2 mm. current d.b.h. increment in the 12th year, falling again by the 25th to 4·4 mm. (mean annual increment 6·6 mm. after and 2 mm. before drainage).

Decreasing increment and the reappearance latterly of *Sphagnum* is attributed to choking of the drains. In general, the best diameter increment occurred 10–15 years after drainage and within 20 m. distance from the drains, where the mean annual diameter increment for 25 years was 5·4 mm. Taking mean diameter increment before drainage (which varied from 0·5–0·7 mm. irrespective of location) as unity, that of the succeeding 25 years was 9 for the zone 0–10 m. from the drain, 7 for the 25–65 m., 5 for the 75–105 m. and 4·7 for the 110–140 m. zone; thus increment decreased progressively with increasing distance from the drain.

A more general sample taken over the drainage area showed that of 465 trees 51 per cent. gave a strong positive reaction to drainage, 14 per cent. a medium positive, 8 per cent. a weak positive, 16 per cent. no reaction and 8 per cent. a negative one. The results are preliminary only, and no conclusions can be drawn on yield per unit area until repeated remeasurements have been made.

38.8. *Torrent Training*

[1245]. 38.8 (44). SORNAY, J. La restauration des terrains en montagne. **[The restoration of mountain lands.]** *Bull. Soc. for. Franche-Comté* 25 (2), 1947 (65–72). [F.]

Notes on successful torrent training at various places in France.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.1. *Air Currents*

[1246]. 42.1 : 12.25. MUNGER, T. T. **Windfall in relation to cutting.** *For. Res. Notes Pacific Nthwest. For. Range Exp. Sta.* No. 34, 1946 (11–12).

Observations on windthrow in relation to road clearings and clear cutting in dense stands of Douglas Fir, Spruce or Hemlock. The 100-ft. zone nearest the cutting is several times more subject to windthrow than the next 100-ft. zone. Both the windward and leeward edges suffer, the former somewhat more than the latter.

42.2. *Temperature Influences. Drought. Insolation*

[1247]. 42.21 : 12.25 : 23.5. **Hoop Pine.** *Rep. For. Comm. N.S.W. 1944*, 1947 (4).

The critical air temperature (i.e. that at which 50 per cent. deaths occur) for two-year-old nursery stock of Hoop Pine (*Araucaria cunninghamii*) was determined at 19° F. and much higher for softer stock. Use of endemic weed species of the original brush, such as Dogwood (*Helichrysum diosmifolium*) as nurse crops is not satisfactory, owing to excessive restraint of growth rate of the Hoop Pine. Experiments are now being made, using *Pinus caribaea*, *P. taeda* and *P. patula* for establishment of Hoop Pine in areas of frost hazard.

[1248]. 42.22 (931) : 21.0. HOCKING, G. H. **Drought in Hawkes Bay.** *N.Z. J. For.* 5 (3), 1946 (230–1).

In the drought of 1945–46 the first exotics to react were *Cryptomeria japonica* and *Cupressus lawsoniana*. *Cupressus macrocarpa*, *Pinus radiata*, *Eucalyptus* spp., Larch and Poplar also suffered in varying degrees, particularly on alluvial gravel flats in the drier localities. Trees growing on hills, even where the soil was shallow and underlain by rock were remarkably resistant compared with those on alluvial flats.

[1249]. 42.23 : 46 : 23.27. FENNER, C. G. **Shade method of direct cambium-to-bark development.** *Pap. Mich. Acad. Sci. 1943*, 29, 1944 (111–2). O.B.

Cf. *For. Abstr.* 5 (286).

Protection of bark-deep wounds from the drying effect of direct sunlight by means of artificial shades erected in such a manner as to hold the burlap rigidly in position 6 in. from the exposed cambium, prevents the death of the cambium by desiccation and allows rapid healing to take place. Where the cambium is undamaged, four to eight weeks is usually sufficient to secure its survival and the development of thick, healthy bark.

42.3. *Precipitations*

[1250]. 42.31 : 12.26–8 : 42.22. INCOLL, F. S. **The Red Gum (*Eucalyptus camaldulensis*, syn. *E. rostrata*) forests of Victoria and the possible effects of water conservation and distribution works in the Murray Valley on the survival of the riverine forests of this species.** *Aust. For.* 10, 1946 (47–50).

43. FOREST FIRES

[1251]. 43 (796) : 92 : 32.29.2. **Slash disposal.** *Rep. Idaho St. For. 1945–6*, [?1947] (9–10).

Account of an act passed in 1945 by the Idaho State legislature, giving the State Forester powers of supervision, control and management of all fire hazard reduction programmes under the forestry laws and empowering him to enter into agreements with land owners and operators for reduction of fire hazard.

43.0 *Predisposing Factors and Causes*

[1252]. 43.0 (47). MELEKHOV, I. S. Sezonȳ lesnȳkh pozharov i postroenie geograficheskoy skhemȳ lesopozharnȳkh poyasov. **[Forest fire seasons and the construction of a geographical system of forest fire zones.]** *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 1–15. [Russ.]

The author stresses the importance of the following factors in the geographical distribution of fires—(i) incidence of the fire season,

(ii) variation in fire risk with the density and activities of populations, (iii) differences in the character of the forests, and (iv) differences in the after-effects of fires (natural reforestation, bog formation, succession to grassland, etc.). Such factors are clearly important in both fire control and the rehabilitation of burnt areas. The author reviews on a world basis the data on forest fires, with special reference to climate and meteorology; includes a sketch-map of the forest fire seasons of the globe; and examines fire data for the U.S.S.R. in greater detail. For Russia in Europe he recognizes tentatively the following zones:—(1) Early (March–April) fires—from the extreme south to about the latitude of Kiev. (2) April fires—from 50–51° to 55–56° N. (3) May fires, with a danger of some April fires—characteristic of the southern portion of the *taiga* (northern coniferous forest) up to about 59° N. (4) May–June fires—northwards of 59°, with subzones: (*a*) southern, with a fire season starting more often in May, (*b*) northern, beginning above the 60th parallel, with a fire season starting more often in late May or June.

Data for Asiatic Russia are very scanty, though over much of the E. Siberian forest May fires are characteristic, and in the Far East the peak period appears to be the same, though fires may occur from March to November. In these eastern regions the chief factors are spring drought, presence of dry grass from the preceding year, and large-scale grass burning by farmers.

The need for further research along these lines is stressed and some preliminary consideration is given to the influence of the time of snow melt, and its variation in different types of forest, on the beginning of the fire season.

[1253]. 43.0 (71) : 07.2. BEALL, H. W. **Research in the measurement of forest fire danger.** Dominion Forest Service, Ottawa. 1947. pp. 9. [5th British Empire Forestry Conference, Great Britain, 1947.]

A review, with references to the literature, of research into and practice of measurement of forest fire danger in Canada. The Wright system is explained, and comparisons are made between different fire-danger rating systems. Some account is given of recent modifications and developments in the field procedures employed by the Dominion Forest Service in fire-danger research. A fairly detailed account is given of methods of measuring fuel moisture content and minimizing the effect of sampling errors.

[1254]. 43.0. RAPRAEGER, H. A. **A procedure for rating the potential fire danger of hazardous areas.** *For. Res. Notes Pacif. Nthwest. For. Range Exp. Sta.* No. 34, 1946 (7–8).

Factors taken into account are: (1) fuel type or hazard; (2) risk or possibility of a fire being started; (3) size of area; (4) ease of protection and control facilities.

[1255]. 43.0 : 22.14.2. RAPRAEGER, H. A. **The change in the fire hazard on partially cut logging areas.** *Timberman* 48 (9), 1947 (50, 52).

The Pacific Northwest Forest and Range Experiment Station has conducted a study in an area where partial cutting by tree selection was practised under a plan approved by the Forest Service. It was estimated that along the logging roads the average small fire will spread about 13 times as fast as it would have spread under forest conditions previous to logging. On areas not affected by road slash, the average rate of spread was estimated to be 5 times as great, and over the whole area 7 times as great as before logging. Balancing this increased rate of burning with better control conditions due to the existence of logging roads, it has been determined that fire hazard has increased 4 times. The increased hazard will decrease as the slash rots and shade increases, and the period of increased fire hazard is put at about 6 years.

[1256]. 43.01 (73) : 07.1. SMITH, W. H. **Forest meteorology.** *J. For.* 45 (7), 1947 (497–9).

A brief review of the application of meteorology to fire control hitherto effected in the United States, and an outline of a course of meteorology for students of forestry.

[1257]. 43.01. CROMER, D. A. N. **Hygrothermographic fire danger rating and forecasting.** *Aust. For.* 10, 1946 (52–71).

The modification of a hygrothermograph to record temperature and relative humidity on the same chart at different scales is described. The maximum distance separating the curves during the dry phase has been termed the burning-conditions index, and an alignment

chart prepared to give this index from wet-and-dry-bulb thermometer readings and humidity tables. The summation of daily 3 p.m. observations of the burning-conditions index after rain has been correlated with inflammability as measured by indicator-stick moisture content. A formula for danger rating based on the summation and current index has been prepared ($D_n = \Sigma_1^{n-1} B + 2B_n$ when D_n = danger rating on the nth day after rain and B = burning-conditions index), and danger ratings so obtained have been compared with the occurrence of fires on the Eastern Dorrigo, N.S.W. The use of the hygrothermograph chart and danger rating so obtained is suggested as a means of forecasting local fire danger. *From author's summary.*

[1258]. 43.01 : 07.7 : 11.14.7. MACLEOD, J. C. **Effect of site conditions on hygrometer readings.** *For. Chron.* 23 (1), 1947 (9–13). [Dominion Forest Service, Ottawa.]

The wet-and-dry bulb hygrometer is probably the most widely used instrument for determining temperature and relative humidity for use in the Wright system of fire-hazard measurement. Except where a standard practice has been established (as in the fire-hazard studies of the Dominion Forest Service) it is seldom found that any two people mount hygrometers in the same site conditions; instruments are seen in conditions varying from full exposure to sun and wind to dense shade in practically dead air. Accordingly tests were made with instruments set up in a variety of conditions, and the results compared with those of instruments in standard conditions. The results are tabulated. Whereas the net errors under standard conditions, for temperature and humidity observations, were 0 and + 1·2 respectively, those under other conditions varied from 0·2 and ± 3 to − 1·9 and ± 5 respectively. The standard practice of the Dominion Forest Service is to mount hygrometers in louvered shelters, located in the open, free from the shadows of buildings and vegetation, fully exposed to winds from all directions, and having the doors facing north. Barely acceptable results were obtained when the instrument shelter was placed in the shade of a few, widely spaced trees or when the hygrometer was hung on a wide verandah wall facing N.W. and open in 3 directions with unobstructed wind movement. Readings were definitely unsatisfactory in (*a*) an instrument shelter placed in a small clearing 100 ft. square, (*b*) an instrument shelter in a dense clump of trees, and (*c*) a 3-sided sun-shade on the wall of a building facing N.W.

43.1. *Protective Measures*

[1259]. 43.11 : 12.25 : 23.6 : 44.3. WAKELEY, P. C., and MUNTZ, H. H. **Effect of prescribed burning on height growth of Longleaf Pine.** *J. For.* 45 (7), 1947 (503–8).

Forty acres of Longleaf Pine [*Pinus palustris*] in central Louisiana, established in 1935, were burned in January, 1938, and again in February, 1941, severely enough to control brown-spot needle disease but not severely enough to injure the trees seriously [cf. *For. Abstr.* 6 (191); 8 (No. 2379)]. The first burn was made when brown spot had killed 37 per cent. of the needle tissue of the seedlings, but before many trees had made height growth. Sixty acres of plantation on a comparable site were left unburned as a check. By July, 1946, 11½ years after planting, survival in the two plantations was the same, but height growth in the burned plantation was far superior to that in the unburned. At 6 by 6 spacing the burned area had 300 trees per acre in vigorous growth as against only 150 in the unburned. In the burned plantation, 64 per cent. of all living trees were above 4½ ft. in height as against only 22 per cent. on the unburned; 72 per cent. were above 1½ ft. high (usually considered the brown-spot danger level), as against only 34 per cent. in the unburned. Much, if not most, of the superior height growth on the burned area seems due to the effectiveness of the fires in controlling brown spot without seriously injuring the seedlings. *Authors' summary.*

[1260]. 43.11 : 24.1 : 12.25. WEAVER, H. **Fire—nature's thinning agent in Ponderosa Pine stands.** *J. For.* 45 (6), 1947 (437–44). [Colville Indian Reservation, Nespelem, Washington.]

A study of the rôle of fire in thinning Ponderosa Pine was made on an area of 40-year-old natural regeneration, part of which had been burned at 8 years of age. It was found that the average diameter at 1 ft. and average height were respectively 1·7 in. and 12·3 ft. in the unburned and 7·4 in. and 32·2 ft. in the burned areas. An examination of

sections of dominant stems in the 40-year age class showed that until 1914 (the year of the fire) the rate of growth was approximately the same in both areas, but thereafter excessive competition and stagnation developed in the unburned stands while the surviving trees in the burned stand had accelerated growth and have continued to grow rapidly. The unburned area has a stocking of 14,800 trees per acre of 40-year-old trees; the burned area has 1,100 per acre 40-year-old trees in the surviving patches, with restocking of 17- and 8-year-old classes between them. The average tree of the 17-year-old class is considerably larger than the average tree of the unburned 40-year-old class. The writer believes that controlled fire can be applied successfully for the proper thinning of such stands.

[1261]. 43.12 (931). PERHAM, F. J. **Aerial fire patrol in the Rotorua district 1945–46 fire season.** *N.Z. J. For.* 5 (3), 1946 (219–24).

Description of organization, radio equipment, types of plane used, and actual operation of the patrol. The presence of patrol planes has a good psychological effect on fire-fighting crews, and is a constant reminder to the general public of the fire danger and the need for care.

[1262]. 43.13. **Training smoke jumpers.** *Timberman* 48 (10), 1947 (46–7, 76).

A short account, with illustrations, of the methods of training forest-fire fighters in parachute jumping in Region One of the U.S. Forest Service.

[1263]. 43.13 : 07.7. GRANT, E. A. **Adapting the 'weasel' to forestry.** *J. For.* 45 (7), 1947 (494–6).

Records a successful experiment at the Angeles National Forest in adapting the Army Cargo Carrier M-29, a track-laying amphibious unit, for fire-control work.

43.3. *Fire Damage*

[1264]. 43.3 : 33.32 (714). SKOLKO, A. J. **Deterioration of fire-killed pulpwood stands in Eastern Canada.** *For. Chron.* 23 (2), 1947 (128–45). [Dominion Laboratory of Forest Pathology, University of New Brunswick.]

After briefly reviewing the literature on the subject, the author reports on the findings of the first 5 years of a study, initiated in 1942, of 6 plots in the Lake St. John and North Shore regions of Quebec. The rate of bark shedding is directly proportional to the severity of the fire and to tree diameter; it is greatest in Balsam, and slightly higher in Jack Pine than in Spruce. The rate of deterioration is correlated with severity of fire, and is of the same order for the three species for the first 4 years, amounting to less than 1 per cent. if windfall and heart rot are discounted. Jack Pine, even after severe fire, becomes heavily stained in the first year. Under conditions of moderate fire, Balsam deteriorates more rapidly than Spruce or Jack Pine. The rate of bark shedding and rate of deterioration are only proportional within specific limits. After severe fires, the greatest losses can be expected in areas of naturally high windthrow; these should be cut first. The low percentage of decay on moderately severely and severely burned areas indicates that losses from this cause are of only secondary importance, at least for the first 5 years. As decay is mostly confined to the lower 3 ft. of the trunk, however, a low percentage of decay may result in considerable stem breakage.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

See also *For. Abstr.* 9 (No. 1276).

[1265]. 44.1. EGLER, F. E. **Effects of 2,4-D on woody plants in Connecticut.** *J. For.* 45 (6), 1947 (449–52).

The data obtained from the spraying of 1946 indicate several modifications of effective procedure. Plants responded more slowly in a cool period than in a warm period and in shade than in light, but eventual effects were about the same. Hardness and age of foliage were chief factors in herbicidal action, and spraying should therefore be done as soon as the foliage is half expanded. Spraying in August had no apparent effect and spraying in July was of doubtful value. Distance of the foliage from the rootstocks is a factor in complete killing; the greater the distance between leaves and roots, the less likely is spraying to result in a complete kill. Available data indicate that Birch, Willow and Sumach are killed easily.

Concentrations of 1,500 p.p.m. appear to be sufficient for all plants under 3 ft. in height. White Ash, Red and Sugar Maples and Blackberries seem to be highly resistant; it is recommended that they should be cut to the ground in the dormant season and later sprayed with a much higher concentration when the foliage is young and tender.

[1266]. 44.1 : 23.61 : 42.5. [**Effect of 2,4-D on different tree species.**] *Rep. Ia. agric. Exp. Sta. 1946*, 1946 (253).

The effect of 2,4-D on different tree species was tested at the State Forest Nursery with the object of using it on weeds in the plantations if it proved harmless to trees. The new leaves of American Elm, Black Walnut, Green Ash, Black Locust, Willow and Cottonwood were killed by this chemical. The succulent new growth of White Pine and Douglas Fir was also affected, but no early effects were noted on Austrian Pine or Blue and White Spruce.

[1267]. 44.1 : 23.22 (411–4). BRAID, K. W. **Bracken eradication.** *Agriculture (J. Minist. Agric., Lond.)* 54 (3), 1947 (112–5). O.R.E.

44.2. *Parasitic Higher Plants*

[1268]. 44.2 : 12.26–8 (791). **Mistletoe investigations.** *Rep. Sthwest. For. Range Exp. Sta. 1946*, [?1947] (54–6).

Destruction of Mistletoe was effected on heavily infested plots in 1933 and a second cleaning was made in 1938. Re-examination of the plots in 1946 showed remarkable freedom from the parasite. The behaviour of the Mistletoe on these plots illustrates the futility of trying to eradicate it in a single operation, but indicates that a single follow-up cleaning after the lapse of 5 years or so may be effective in holding the parasite in check for practical purposes.

44.3. *Fungi*

See also *For. Abstr.* 9 (Nos. 828, 841, 1203, 1259, 1308–9).

[1269]. 44.3. STAKMAN, E. C., and CHRISTENSEN, C. M. **Aerobiology in relation to plant disease.** *Bot. Rev.* 12 (4), 1946 (205–53).

Most of the wind-disseminated fungi pathogenic to plants produce enormous numbers of spores in a very short time. Usually these spores are forcibly ejected into the air, often at a time when optimum conditions for dispersal or infection prevail. Most of the wind-disseminated spores are exceedingly buoyant and can easily be caught by even minor convection currents and quickly carried to heights of several miles. They have been trapped as high as 36,000 ft. and many of them are present in abundance at 1–2 miles above the earth. As they fall at a rate measured only in millimetres per minute in still air, they are capable of being carried hundreds or even thousands of miles by the wind. Effective distribution, however, depends upon viable spores being carried to a susceptible plant at the proper stage of development and under conditions which will permit infection. The spores of some fungi, such as the conidia of *Phytophthora infestans* and *Sclerospora philippinensis* and the basidiospores of *Cronartium ribicola* and many other rusts are produced only during periods of high humidity and can survive only short periods of desiccation or exposure to sunlight. This, together with the fact that spores fall more rapidly in moist than in dry air, tends to limit effective dissemination of such spores to comparatively short distances. On the other hand, the chlamydospores of most smuts, and the aeciospores and urediospores of practically all rusts may be produced in a humid atmosphere, but are liberated and survive long travel in dry air. Details are given of effective long-distance dissemination of *Puccinia graminis tritici*, a stem rust of wheat, which has been confirmed by studies carried on over 20 years. Although more precise evidence of wind dissemination has been accumulated for cereal rusts, the principle probably applies to other plant pathogens also. *From author's summary.*

[1270]. 44.3 : 12.25 : 12.21 (75) : 12.26–8. KERN, F. D., and WEST, E. **Another gymnosporangial connection.** *Mycologia* 39 (1), 1947 (120–5). [Pennsylvania State College and Florida Agric. Exp. Sta.] P.R.

The telial stage of *Roestelia hyalina* Cooke (*Gymnosporangium hyalinum* [Cooke] Kern) is described. The aecia of the fungus have been found on *Crataegus* spp. and *Pyrus* spp. in North Carolina, South Carolina, and Florida, and the telia have been reported on *Chamaecyparis thyoides* in South Carolina and Florida.

[1271]. 44.3 : 12.25 : 12.21. HAHN, G. G. **Berg's rust-resistant Red Cedar susceptible to *Phomopsis juniperovora* in greenhouse tests.** *Phytopathology* 37 (7), 1947 (530–1).

Cf. *For. Abstr.* 2 (246).

[1272]. 44.3 : 12.25 : 12.21 (471). MELEKHOV, I. S. O povrezhdeniyakh elovykh lesov severnoy taygi rzhavchinnym gribom *Chrysomyxa ledi.* [**Damage to the Spruce stands of the northern coniferous forest by the rust fungus *C. ledi.***] *Sborn. nauchno-issledov. Rabot Arkhangel. lesotekh. Inst.* No. 8, 1946. pp. 59–75. [Russ.]

Attacks by *C. ledi* on foliage of Spruce [*Picea abies*?], the aecial host, are widespread and sometimes occur on an epidemic scale in the northern coniferous forests of Russia, where the fungus can be a serious danger. The telial stage is spent on *Ledum palustre*, and the risk to Spruce depends on the ecology of this shrub, which (with its associates *Vaccinium uliginosum, Cassandra calyculata*, etc.) is not only abundant on the boglands but also occurs in the more northerly regions on higher and drier sites. Infection of Spruce varies with the varying frequency of *L. palustre* in different forest types, except where the relation is disturbed by abundance of the shrub in some neighbouring tract. A special study, in summer 1945, of a mass infection in the northern Dvina basin showed that the severity of infection was: (1) highest in the topmost part of the crowns; (2) higher in the upper than in the lower layers of storeyed stands; (3) very high in thinned stands and still higher on trees on cut-over areas, with the exception of those recently cut over; (4) lower in young growth, especially under canopy (though increasing with increasing size of the young trees), and lowest in natural regeneration at the seedling stage. Light thus appears to be the most important factor in the aecial stage. The character of the needles is also important, the best development of the fungus occurring in young, 'succulent', dark green, well developed needles: shade and sun needles are not equally favourable environments. Infection probably varies also with meteorological conditions, e.g. areas heavily infected in 1944–45 showed no mass infection in 1946, possibly owing to the hot, dry summer of the latter year.

Possible control measures include modification of felling plans, effective destruction of *L. palustre* (for which it is thought that in clear-felled areas a heavy burn should be suitable) and possibly aerial dusting. For nurseries, Spruce hedges, and trees in parks, ordinary spraying might suffice.

The need for further research on the telial stage of the fungus is emphasized.

[1273]. 44.3 : 12.25 : 12.21. WATERMAN, A. M. ***Rhizosphaera kalkhoffi* associated with a needle cast of *Picea pungens*.** *Phytopathology* 37 (7), 1947 (507–11).

This disease, first noted in the United States in 1938 in Connecticut, has since then been reported in various parts of the Eastern United States and Canada on *Picea pungens*. It has never been reported on *P. pungens* in its native range. Satisfactory control of the disease on ornamental trees can be obtained by spraying with 4–4–50 Bordeaux mixture to which casein has been added as a spreader.

[1274]. 44.3 : 12.25 : 12.21 (711). BIER, J. E., FOSTER, R. E., and SALISBURY, P. J. **Studies in forest pathology. IV. Decay of Sitka Spruce on the Queen Charlotte Islands.** *Tech. Bull. Dep. Agric. Can.* No. 56, 1946. pp. 35 + plates. (*Publ. Dep. Agric. Can.* No. 783.)

[Cf. *For. Abstr.* 2 (194); 8 (Nos. 2098–9).]

The logs of 1,977 living trees of Sitka Spruce on the Queen Charlotte Islands were scaled, graded, and analysed for loss through decay. These trees represented a gross merchantable volume of 13,963,223 bd ft. of which 1,608,977 bd. ft. or 11·5 per cent. was destroyed by decay. The amount of decay recorded represents the loss on the basis of present standards of utilization.

A large part of the rot in mature and overmature trees on the slope and bench types occurs in the upper part of the trunks which would yield Grade 3 logs for reasons other than the presence of decay. The percentages of decay in Grades 1, 2 and 3 were 7·2, 7·1 and 23·4 respectively.

During this study 31 species of fungi were found causing decay in living trees. The following are the major species: *Fomes pini, Polyporus schweinitzii, Fomes pinicola, Lentinus kauffmanii* (which causes brown pocket rot), *Trametes serialis, Poria microspora, Polyporus*

sulphureus, Fomes laricis, Poria subacida, and *Poria colorea.*

Except in the instances of red ring rot (*Fomes pini*) no reliable external indications of the presence and extent of the different decays in living trees were found. Broken tops and scars caused by falling trees usually indicate decay but provide little information as to its extent.

Although red ring rot was the most important decay in the amount of wood destroyed (4·6 per cent. of the total volume measured), it was of little importance in the Grade 1 and Grade 2 logs recovered from diseased trees. Brown butt rot (*Polyporus schweinitzii*) ranked second in importance to red ring rot, having destroyed 1·9 per cent. of the gross merchantable volume. This decay was followed by brown crumbly rot (*Fomes pinicola*) which had decayed 1·5 per cent. of the gross merchantable volume. Each of the remaining fungi had destroyed less than 1·0 per cent. of the total volume measured. Brown pocket rot (*Lentinus kauffmanii*) did not prove serious on the areas investigated. A majority of the loss from this decay occurred in Grade 1 logs. There were 119 infections of the dry-rot fungi of timbers in service (*Trametes serialis* and *Poria microspora*) which had destroyed 0·7 per cent. of the gross merchantable volume.

The results indicate a relationship between age and decay. On the slope and bench types little decay was found in trees under 200 years of age. The average net periodic increment on a basis of gross merchantable volume began to decrease in trees from 250–300 years of age.

No consistent difference was apparent in the percentage of the gross merchantable volume lost through decay when the trees of the different age classes were divided into fast- and slow-growing groups.

The average gross and net merchantable volumes in the different diameter classes were similar for trees on the slope and bench types. Trees on the slope type contained appreciably more Grade 1 wood (an average of 1,000 bd. ft. per tree) than those analysed on the bench type. A local volume table is presented which indicates the average gross and net merchantable volumes for Sitka Spruce in the different diameter classes. *From authors' summary.*

[1275]. 44.3 : 12.25 : 46 : 32.7. WRIGHT, E., RHOADS, A. S., and ISAAC, L. A. **Decay losses following logging injury in partially cut stands of Western Hemlock and Sitka Spruce.** *Timberman* 48 (10), 1947 (52, 54, 72, 74, 76). [Pacific Northwest Forest and Range Experiment Station.]

The first report on this project was made in 1944 [see *For. Abstr.* 6 (p. 114)]. The present paper briefly summarizes results of the 1945 studies. About half the residual trees injured by logging became infected by wood-rotting fungi in a period varying from 5 to 32 years. Growth rate and rate of decay varied on different areas and there was no apparent relationship between growth rate and the amount of decay present. Decay following logging injury amounted in Western Hemlock to 41 per cent. of the calculated gross increment since logging, and in Sitka Spruce to 43 per cent. Injuries examined were of 3 main types (1) trunk wounds, most of which are basal, (2) top breakage, (3) sunscald following partial cutting. The most frequent rot in Western Hemlock was caused by *Fomes annosus* (50 per cent. of the decay associated with trunk wounds) and that in Sitka Spruce by *F. pinicola* (60 per cent. of decay volume). Decay caused by the former fungus is somewhat less serious than that caused by the latter, since affected wood can be used in the manufacture of low-grade paper.

A reduction of decay loss in partial cutting can only be effected by a reduction in the amount of logging injury, which could probably be secured by the use of lighter machinery or of horses in skidding, by confining skidding as much as possible to main skid roads with a minimum of curves, by avoiding skidding in the spring 'bark-slipping' season when trees are most susceptible to injury, and by taking out severely injured trees at the close of each cutting operation. It was apparent that lighter cuts resulted in less logging injury, less sunscald and less loss by windthrow.

[1276]. 44.3 : 12.25 : 12.21 : 23.23.15 : 23.26.4 : 44.1. RIKER, A. J., GRUENHAGEN, R. H., ROTH, L. F., and BRENER, W. H. **Some chemical treatments and their influence on damping-off, weed control, and winter injury of Red Pine seedlings.** *J. agric. Res.* 74 (3), 1947 (87–95). O.R.E.

A seed treatment with mercuric phenyl cyanamide and cadmium oxide, supplemented by a soil treatment with calomel, was relatively

effective against damping-off from *Pythium* and *Rhizoctonia* in Wisconsin's sandy soil. A soil treatment with tetramethyl thiuramdisulphide was relatively effective not only against this damping-off but also against many weed seeds and winter injury. *From authors' summary.* [Cf. *For. Abstr.* 9 (No. 841).]

[1277]. 44.3 : 12.26–8 : 12.21. THIRUMALACHAR, M. J. **Some noteworthy rusts—II.** *Mycologia* 39 (2), 1947 (231–48). [Univ. of Wisconsin, Madison, Wis.] P.R.

Includes notes on *Hemileia wrightiae* on *Wrightia tinctoria* and *Mainsia pterocarpi* n.sp. on *Pterocarpus marsupium.*

[1278]. 44.3 : 12.26–8 : 12.21. WAGENER, W. W., and KIMMEY, J. W. **Copper carbonate for Chestnut root disease.** *Abstr.* in *Phytopathology* 37 (5), 1947 (365).

European Chestnut, 80 years old, attacked by a crown rot (?*Phytophthora*), were treated by a method reported by Landaluze in Spain. The soil was excavated from around the bases of the trees, and the cleaned bark was painted with a suspension of copper carbonate in water to which $\frac{1}{8}$ lb. per gal. of casein glue had been added as an adherent. The soil was then refilled around the trees. Three trees, 70-percent. or more girdled by the disease when treated, later succumbed or became completely girdled; three others showed small extensions of girdling; and the remaining six suffered no further injury.

[1279]. 44.3 : 12.26–8 : 12.21 (45). BIRAGHI, A. Cancro della corteccia del castagno. [**Bark canker of Chestnut.**] R. Stazione di patologia vegetale, 13 Via S. Susanna, Rome. 1946. pp. 8. [It.] X.

Notes on Chestnut blight (*Endothia parasitica*) put out by the Italian Ministry of Agriculture, to help in the identification of the disease. It is urged that not only officials and owners of Chestnut plantations, but every citizen, should notify the Forest Service, or one of the Plant Disease Observatories (a list of which is given, with addresses) of any infected trees. The characteristic cankers and other diagnostic features are described.

For purposes of spotting infected trees at a distance or when the infected part is high up or out of sight, certain secondary manifestations are of great value. These are described.

[1280]. 44.3 : 12.26–8 : 12.21 (75). CLAPPER, R. B., GRAVATT, G. F., and STOUT, D. C. ***Endothia* canker on Post Oak.** *Plant Dis. Reptr.* 30 (10), 1946 (381). I.M.I.

Endothia parasitica has been reported as causing cankers on Post Oak (*Quercus stellata*) in Maryland and other states in the south-east. Both American and Asiatic Chestnuts were successfully inoculated with the fungus from the Post Oak, but Post Oak inoculated with *E. parasitica* from American Chestnut had not produced cankers 8 months later.

[1281]. 44.3 : 12.26–8 : 12.21 : 23.26. RHOADS, A. S. **An unusual case of *Clytocybe* root rot in *Ficus elastica* propagation stock in a Florida nursery.** *Phytopathology* 37 (7), 1947 (523–4).

The practice of sprinkling the plants daily to keep the moss layers damp round the branches (used to induce rooting) was highly conducive to infection and rapid development and spread of the disease.

[1282]. 44.3 : 12.26–8 : 12.21 (85). CRANDALL, B. S. **A new *Phytophthora* causing root and collar rot of *Cinchona* in Peru.** *Mycologia* 39 (2), 1947 (218–23). [Estación Experimental Agricola de Tingo María, Peru.] P.R.

A disease of the root and collar tissue of Ledger form *C. officinalis* plantation trees and of nursery stock of this species and of *C. pubescens* has been caused in two localities in Peru by *Phytophthora quininea* n.sp. *C. officinalis* and *C. micrantha* are also susceptible.

[1283]. 44.3 : 12.26–8 : 45.3. GOIDANICH, G., VIVANI, W., and MEZZETTI, A. La 'lebbra' del pioppo. [**Poplar 'leprosy'.**] *Ital. for. mont.* 2 (3), 1947 (149–55 + plates). [It.]

A new disease has appeared on 'Canadian' Poplars at S. Piero a Grado near Pisa. The earliest visible symptoms consist of patches on the trunk about a handsbreadth or more in width, of a brownish-ochre colour, dry, of a regular ogival form, and slightly fissured, with their base at ground level, and usually on the north side of the tree. These differ from the lesions of *Chondroplea populea*, which they much resemble, in not having a sharp line of demarcation between the affected and healthy tissues. The lesion is very superficial, particularly at the edges, and even in the centre and

at the base it does not reach the phloem or cambium. This type of lesion was observed during June and July; in the course of the summer it increased rapidly, so as to extend over a half or even three-quarters of the girth of the tree, and at the same time the colour changed to dark brown or black, while deep fissures extended longitudinally all over the affected area and exuded a yellowish-black lymph, particularly in the lower part. The surface became covered with fructifications of Micromycetes, Sphaeropsidales, and Ascomycetes. The alteration of the tissues went deeper and in some places reached the wood which then turned a brownish-red colour. Towards the end of the summer the bark began to fall off progressively from the base upwards until the whole circumference was naked. At the same time, or a little sooner, the superficial layers of the bark broke up into quadrangular flakes, with curled-up edges, giving the tree the characteristic appearance which led to the use of the term leprosy for the disease. The lesions formed in the previous year were surrounded by a formation of callus, giving the scar the appearance of an open canker. It is believed that the disease is due primarily to attack by a woolly aphis (of the same type as *Phloemyzus passerinii*) complicated by consequent attack by a complex of fungi.

[1284]. 44.3 : 12.26–8 : 12.21 : 21.32 : 11.47.13. PARKER, K. G., TYLER, L. J., WELCH, D. S., and POPE, S. **Nutrition of the trees and development of Dutch Elm disease.** *Phytopathology* 37 (4), 1947 (215–24). [Cornell Univ., Ithaca, N.Y.]

Experiments with small trees of *Ulmus americana* potted in subsoil and with larger trees planted in the open indicate that well balanced soil treatments reduce disease development in trees infected by *Ceratostomella ulmi*. There appears to be no danger in keeping trees in a good growing condition provided that they are not pruned too heavily and a succulent type of tissue is not produced. Nitrogen is necessary, but care should be exercised in the amounts applied. The favourable effect of phosphorus in aiding the tree to survive when diseased is particularly significant. Potassium appears to be of less importance but was beneficial in a treatment for the very poor soil used in this study.

[1285]. 44.3 : 12.26–8 : 12.21. CARTER, J. C. **Wetwood of Elms.** *Bull. Ill. nat. Hist. Surv.* 23 (4), 1945 (401–48).

This bulletin expands a previous report of the author's researches into wetwood of Elm, which has been shown to be due to a species of bacterium belonging to the genus *Erwinia* (*nimipressuralis* n.sp.). [Cf. *For. Abstr.* 7 (No. 947); 9 (No. 1024).]

[1286]. 44.3 : 12.26–8 : 12.21. CARTER, J. C. ***Tubercularia* canker and dieback of Siberian Elm (*Ulmus pumila* L.).** *Phytopathology* 37 (4), 1947 (243–6).

Branch and trunk cankers on Siberian Elms, 4 to 10 ft. tall, in Illinois were due to *Tubercularia ulmea* n.sp.

44.4. *Virus Diseases*

[1287]. 44.4 : 12.26–8 (747). DODGE, B. O. **The brooming disease of Walnut.** *J. N.Y. bot. Gdn.* 48 (569), 1947 (112–4).

An unidentified virus disease of *Juglans sieboldiana* in New York.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

[1288]. 45.1 : 45.2 : 23.1 : 23.2 (73). SMITH, C. F., and ALDOUS, S. E. **The influence of mammals and birds in retarding artificial and natural reseeding of coniferous forests in the United States.** *J. For.* 45 (5), 1947 (361–9).

A review of the subject with 65 references to the literature. There is a list of species known to eat the seeds of coniferous trees. Protective measures are considered under the heads of extermination of seed-eating species, use of repellents or mechanical barriers, and cultural control (ground preparation, time of planting, methods of sowing).

45.3. *Insects*

See also *For. Abstr.* 9 (Nos. 801–4).

[1289]. 45.3 (71). GRYSE, J. J. DE. **Forest entomology in Canada.** Dominion Forest Service, Ottawa. 1947. pp. 7. [5th British Empire Forestry Conference, Great Britain, 1947.]

[1290]. 45.3 : 91.1 : 01.6. STAMMERS, F. M. G., and WHITFIELD, F. G. S. **The toxicity of DDT to man and animals. A report on the work carried out at the Royal Naval School of Tropical Hygiene, Colombo, and a review of the world literature to January, 1947.** *Bull. ent. Res.* 38 (1), 1947 (1–73).

[1291]. 45.3. O'KANE, W. C. **Results with benzene hexachloride.** *J. econ. Ent.* 40 (1), 1947 (133–4). [New Hampshire Agric. Sta., Durham.]

Highly satisfactory results were obtained with benzene hexachloride against the Elm leaf beetle, Leconte's sawfly, European Elm scale, spiny Elm caterpillar, Cottonwood leaf beetle, and Japanese beetle.

[1292]. 45.3 : 13.15 : 13.2 : 12.26–8. ELLIS, J. C. S. **The rôle of birds in checking defoliating moths.** *Naturalist, Lond.* No. 821, 1947 (52–5). O.R.S.

Notes collected during 1944–46 in the Sessile Oak woodlands of the Upper Dearne Valley in the West Riding of Yorkshire. The great tit (*Parus major newtoni*) and the blue tit (*Parus caeruleus obscurus*) afforded the most consistent check on all stages of *Tortrix viridana*. The most concentrated attack on the larvae of *T. viridana* and *Hybernia defoliaria* was by the starling (*Sturnus v. vulgaris*).

[1293]. 45.3 : 12.25 : 13.2. ELIESCU, G., and DIMITRIU-MIHAILESCU, S. Experimentări cu Hylarsol pentru combaterea gândacului *Hylobius abietis*. **[Experiments with 'Hylarsol' [an arsenic-containing compound] on *Hylobius abietis*.]** *An. Inst. Cerc. Exp. for., București* (*Ser. I*), 8, 1942 (158–64). [Rum.] D.S.I.R.

[1294]. 45.3 : 12.25 : 13.2 (729.9.). **Control of pests attacking the Bermuda Cedar.** *Rep. Pl. Path. Dep. Agric. Bermuda 1946*, 1947 (2–9).

A report on the spread of *Lepidosaphes newsteadi* and *Diaspis visci* on the native Cedar (*Juniperus bermudiana*) and the methods of biological control being used against them.

[1295]. 45.3 : 12.25 : 13.2 (729.9). THOMPSON, W. R. **Interim report on two scales attacking the Bermuda Cedar.** Department of Agriculture, Bermuda. 1947. pp. 3. [Imperial Bureau of Biological Control.]

The Diaspis scale (*Diaspis visci*) on *Juniperus bermudiana* should soon be brought under control by *Aspidiotiphagus lounsburyi*. *Lepidosaphes newsteadi*, the oyster shell scale, on the other hand, is rarely parasitized and may destroy practically all the Junipers in Bermuda within a few years. The introduction of additional parasites and predators has been started with ladybirds from California and Trinidad, and from Canada, a predacious mite and a parasite which have effectively controlled a scale closely allied to the Juniper oyster shell.

[1296]. 45.3 : 12.25 : 13.2 (74) : 24.3. MACALONEY, H. J. **The entomological aspects of forest management in the Spruce budworm problem in the North-eastern United States.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 3 (2), 1947 (4–5).

Research is being conducted along two main lines. (1) The inspection of stands for cutting experiments, (*a*) to prevent or decrease timber losses in localities known to be infested or in imminent danger of infestation, (*b*) to render stands more resistant to budworm attack through changes in cutting cycles and conversion to more vigorous growing stock. (2) Determination of the relation between forest-stand conditions and the development of large populations of Spruce budworm. Details are given of the experimental plots which have been established and the preliminary observations made.

[1297]. 45.3 : 12.25 : 13.2. **Mapping budworm danger areas.** *Rep. Ntheast. For. Exp. Sta. 1945–6*, 1947 (22–3).

Cf. *For. Abstr.* 8 (pp. 336–7).

A simple formula for rating a stand's vulnerability to budworm attack has been used successfully in classifying and mapping more than a million acres of Spruce/Fir forest in the North-eastern United States. The formula is:—

$$\text{Vulnerability} = V \times BA$$

where V is volume of Balsam Fir in cords per acre and BA is basal area of the average Balsam Fir at b.h.

[1298]. 45.3 : 12.25 : 13.2 : 13.15. BROWN, N. R. **Studies on parasites of the Spruce budworm, *Archips fumiferana* (Clem.). I. Life history of *Apanteles fumiferanae***

Viereck (Hymenoptera, Braconidae). *Canad. Ent.* 78 (6), 1946 (121–9). O.R.S.

[1299]. 45.3 : 12.25 : 13.2 : 13.15. BROWN, N. R. **Studies on parasites of the Spruce budworm, *Archips fumiferana* (Clem.). 2. Life history of *Glypta fumiferanae* (Viereck) (Hymenoptera, Ichneumonidae).** *Canad. Ent.* 78 (7/8), 1946 (138–47). O.R.S.

[1300]. 45.3 : 12.25 : 13.2 (713) : 714) : 13.15. WILKES, A. **The introduction of insect parasites of the Spruce budworm, *Archips fumiferana* Clem., into eastern Canada.** *Canad. Ent.* 78 (4), 1946 (82–6). O.R.S.

In 1943 over 10,000 adults of *Phytodietus umiferanae*, *Ceromasia auricaudula*, *Phorocera incrassata* and *Pseudosarcophaga affinis*, collected near Lillooet, B.C., were released in infested areas of Ontario and Quebec. Methods of collecting, rearing and liberating the parasites are described.

[1301]. 45.3 : 12.25 : 13.2 (74) : 13.15. DOWDEN, P. B., and CAROLIN, V. M. **Studies on the biological control factors affecting the Spruce budworm in the United States.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 3 (2), 1947 (6–7). [Bureau of Entomology and Plant Quarantine, U.S.D.A., New Haven, Conn.]

During 1946 intensive studies were conducted in the Adirondacks, where the budworm has reached outbreak proportions. *Apanteles fumiferanae* and *Glypta fumiferanae* were present in all plots, where their combined parasitization averaged 30 per cent., with a range from 8 to 44 per cent. *Apanteles* was almost twice as common as *Glypta*. From 10 to 50 per cent. of larvae were parasitized by the tachinids *Phryxe pecosensis* and *Aplomya caesar*. Combined parasitization from 21 to 59 per cent. was noted with *Ephialtes ontario* and *Itoplectis conquisitor*. Only one egg parasite, *Trichogramma minutum*, was recovered. All these parasites were present in a 50-acre plot that had been sprayed with DDT by aeroplane. The spray was applied when budworm larvae were in the fifth instar, and the number of larvae was greatly reduced. Nevertheless, the survivors were attacked by the various parasites in about the same proportions as in the other plots.

[1302]. 45.3 : 12.25 : 13.2 (71) : 13.15. ATWOOD, C. E. **The feeding habits of young Spruce budworm larvae.** *Canad. Ent.* 74 (3), 1944 (64–6). O.R.S.

[1303]. 45.3 : 12.25 : 13.2 (74) : 13.15. JAYNES, H. A., and SPEERS, C. F. **Studies of the biology and effect of environment on Spruce budworm abundance.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 3 (2), 1947 (6). [Bureau of Entomology and Plant Quarantine, U.S.D.A., New Haven, Conn.] Cf. *For. Abstr.* 9 (No. 803).

Observations on 300 tagged needles indicated that the larvae of the Spruce budworm began leaving the needles and going into the buds about May 22nd; by May 27th 65 per cent. had entered the buds, while 5 per cent. still remained in the needles. There was an unaccounted loss of 30 per cent. Feeding on staminate flowers produced no significant difference in number of eggs laid or in the sex ratio.

[1304]. 45.3 : 12.25 : 13.2 : 21.8. LEJEUNE, R. R., and BLACK, W. F. **The influence of Jack Pine pollen on the epidemiology of the Jack Pine budworm.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 3 (2), 1947 (4).

Cf. *For. Abstr.* 8 (Nos. 705, 2763). Jack Pine staminate flowers are evidently the preferred site for newly emerged budworm larvae in spring; when the pollen is exhausted they migrate to foliage of the current year. Rate of growth is accelerated by the presence of pollen in the diet, but the benefits, if any, derived from speedier development are not readily apparent. Accelerated growth occurs in the second stage, while in the succeeding stages the rate of growth is equal to or less than that of larvae feeding exclusively on foliage. The net result is that pollen-fed larvae pupate, on an average, about 1·8 days earlier than foliage-fed larvae. Indications are that larvae with access to pollen give a significantly higher rate of survival than those reared on pollen alone. No detectable difference in sex ratios due to diet was shown in field-collected material. Points still to be investigated are the influence of pollen on mating, fecundity and overwintering survival. Results to date lead to a belief that the favourable effect of pollen on budworm populations is made up of an accumulation of small measurable differences affecting various phases of the life cycle.

[1305]. 45.3 : 12.25 : 13.2 (713) : 13.11. SMITH, S. G. **Cytogenetic investigations [on Spruce and Jack Pine budworm in Ontario.]** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 3 (2), 1947 (3).

Cf. *For. Abstr.* 8 (No. 704). Three additional isolation mechanisms which prevent cross-mating between the Balsam/Spruce and Jack Pine species of budworm have been demonstrated. (1) Laboratory-conducted mate-choice tests showed that mating within species outweighs that between species in the proportion of about 4 : 1. (2) The Balsam/Spruce species tends to mate 3 hours earlier in the day than the Jack Pine species. (3) The chromosomal difference between the two species has been found to impose about 5 times as much sterility upon the hybrids as normally occurs in the two species. Furthermore, the total egg output of hybrid females is lower. The existence of these isolation mechanisms indicates that there is little to fear as a result of possible breakdown of the main factor operating against hybridization in nature, that is, the difference in seasonal development. However, should this complex of factors fail, the evidence so far is that the hybrids would show a preference for feeding on Balsam.

[1306]. 45.3 : 12.25 : 13.2. WEIDMAN, R. H., and ROBBINS, G. T. **Attacks of pitch moth and turpentine beetle on Pines in the Eddy Arboretum.** *J. For.* 45 (6), 1947 (428–33).

A study made during 1943–4 at the Eddy Arboretum in California failed to establish a definite order of selectivity in the selection of host trees by *Vespamima sequoia* and *Dendroctonus valens*, but, on the whole, introduced species suffered more heavily than native Californian species.

[1307]. 45.3 : 12.25 : 13.2 (794) : 24.3. BONGBERG, J. W. **Experimental cutting for beetle control at the McCloud River Lumber Company.** *Timberman* 48 (7), 1947 (128–30). [U.S. Bureau of Entomology and Plant Quarantine.]

The removal of high-risk trees in light sanitation cuts in a Pine stand in north-eastern California prevented Pine-beetle increase during the six years prior to harvest cutting. A comparison with the losses due to Pine-beetle damage in the surrounding uncut stands showed a reduction in loss in the cut area of approximately 84·7 per cent. Increased costs of the sanitation cuts were offset by the protection afforded to the remaining timber. [Cf. *For. Abstr.* 4 (193).]

[1308]. 45.3 : 12.25 : 13.2 : 44.3 : 12.21. ANDERSON, R. F. **Saratoga spittlebug injury to Pine.** *J. econ. Ent.* 40 (1), 1947 (26–33). [U.S. Bureau of Entomology and Plant Quarantine.]

Results of a co-operative study on the relationships of *Aphrophora saratogensis*, the fungus *Chilonectria cucurbitula*, and injury to Pine.

Each adult *A. saratogensis*, feeding on Jack Pine or Red Pine twigs, excreted about $\frac{1}{3}$ cc. of liquid every 24 hours and produced a necrotic spot (3 sq. mm.) in the inner bark. Following this tissue destruction, resin infiltrated into the conductive tissue and apparently interfered with water conduction. After the moisture content of the current season's shoots decreased considerably below the normal, the needles yellowed and the branches died.

Prevention of insect feeding prevented further injury, even though the fungus was established in dead tops, branches and twigs of the trees, as a result of the previous season's attack.

[1309]. 45.3 : 12.25 : 13.2 (410) : 44.3. **The Douglas Fir *Adelges*.** *Rep. imp. for. Inst. 1945–46*, 1947 (17).

Adelges ceases to attack Douglas Fir in plantations at Tubney, Berkshire, and elsewhere, when the trees are in the early stages of die-back due to fungus disease.

[1310]. 45.3 : 12.25 : 13.2 : 47. RICHMOND, H. A. **Western Hemlock looper.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 3 (2), 1947 (2).

The estimation of probable mortality of timber stands is of great importance in salvage operations, and studies have been pursued on a number of permanent sample plots. It is evident that the inner bark is not a reliable indicator of the tree's condition in the spring following defoliation. More important is the condition of spring bud development and the production of current new wood. It is estimated that a Fir or Hemlock defoliated 80 per cent. has but one chance in ten of survival, and in some areas the critical defoliation may be nearer 60 per cent.

[1311]. 45.3 : 12.26–8 : 13.2 (666.8). ALIBERT, H. Note sur quelques insectes déprédateurs des plantes cultivées ou spontanées en Côte d'Ivoire. [**Note on some injurious insects on cultivated or wild plants of the Ivory Coast.**] *Agron. trop.* 1 (7/8), 1946 (388–99). [F.] E.M.B.

Includes notes on the following pests: *Acraea alciope* on *Boehmeria nivea*, *Papilio dardanus* on *Citrus*, *Rhodoneura myrsusalis* on *Achras sapota*, *Pompostola hypparchus* on *Eriodendron anfractuosum*, *Phytolyma lata* on *Chlorophora excelsa*. [cf. *For. Abstr.* 9 (Nos. 1316–7).]

[1312]. 45.3 : 12.26–8 : 13.2 (669). GOLDING, F. D. **Further notes on the food-plants of Nigerian insects, VI.** *Bull. ent. Res.* 38 (1), 1947 (75–80).

The last paper of a series appearing irregularly in *Bull. ent. Res.* (Vols. 18, 22, 26, 28 and 31), containing additional data obtained between November, 1939, and December, 1945. The data are set out in tabular form and indicate the name of the insect, the food plants, the part attacked, the month of appearance, and the locality in which the insect has been found as adult, larva or nymph.

[1313]. 45.3 : 12.26–8 : 13.2. RISBEC, J. Note sur deux cérambycides nuisibles des colonies françaises. [**Note on two injurious cerambycids from the French colonies.**] *Agron. trop.* 1 (9/10), 1946 (504–9). [F.]

Cordylomera nitidipennis on *Khaya senegalensis* in Senegal and *Ptychodes trilineatus* ssp. *insularis* on Figs, *Spondias dulcis*, and *Inocarpus edulis* in Tahiti.

[1314]. 45.3 : 12.26–8 : 13.2. SWEETMAN, H. L. **Further data on the value of hand control of the tent caterpillar, *Malacosoma americana* Fabr. (Lepidoptera, Lasiocampidae).** *Canad. Ent.* 77 (11), 1945 (202–3). O.R.S.

Supplement to article in *Canad. Ent.* 72, 1940 (245–50). Mechanical destruction of the larvae in the tents shortly after hatching has given satisfactory results with a minimum expenditure of time and money.

[1315]. 45.3 : 12.26–8 : 13.2 (669.9). BAGUENA CORELLA, L. Un grave peligro para el Ylang-Ylang en Fernando Póo: *Bulnaea alcinoe* Cramer (Lepidoptera, Saturnidae) sobre *Cananga odorata* Hook. (Anonaceae). [**A grave danger to Ylang-Ylang in Fernando Po: *Bulnaea alcinoe* on *Cananga odorata*.**] *Publ. Direcc. Agric. Terr. esp. Golfo Guinea* No. 7, 1943 (27–48 + plates). [Span.] I.I.E.

[1316]. 45.3 : 12.26–8 : 13.2. ALIBERT, H. *Phytolyma lata* Scott. var. *fusca* var.n., Psyllide vivant sur Iroko (*Chlorophora excelsa*). [***Phytolyma lata* Scott. var. *fusca* n.var., a psyllid living on *Chlorophora excelsa*.**] *Agron. trop.* 2 (3/4), 1947 (165–6). [F.]

Cf. *For. Abstr.* 9 (No. 1311).

[1317]. 45.3 : 13.2 : 13.15. RISBEC, J. Note au sujet des parasites du *Phytolyma lata*. [**Note on the parasites of *Phytolyma lata*.**] *Agron. trop.* 2 (3/4), 1947 (167–9). [F.]

[1318]. 45.3 : 12.26–8 : 13.2 (941) : 13.15. SHORT, J. R. T. **Description and life history of a new Western Australian coccid.** *Proc. Linn. Soc. N.S.W.* 71 (Parts 5/6, Nos. 327/8), 1947 (257–9). D.S.I.R.

A description of *Apiomorpha egeria*, a new species of coccid causing an infestation of galls in the *Eucalyptus gomphocephala* plantations on Rottnest Island off the coast of Western Australia.

[1319]. 45.3 : 12.26–8 : 13.2 (72). SHAW, J. G. **Hosts and distribution of *Anastrepha serpentina* in northeastern Mexico.** *J. econ. Ent.* 40 (1), 1947 (34–40). [U.S. Bureau of Entomology and Plant Quarantine.]

Alternative hosts include fruits of *Annona glabra*, *Lucuma standleyana*, *L. salicifolia*, *Sideroxylon tempisque*, *Manilkara zapotilla*, *Calocarpum mammosum*, *Chrysophyllum cainito*, *Bumelia laetevirens*, and *Mammea americana*.

[1320]. 45.3 : 12.26–8 : 13.2 : 12.21. MARTIN, C. H. **Effect of phloem condition and phloem moisture on the entry of *Scolytus multistriatus*.** *J. econ. Ent.* 39 (4), 1946 (481–6).

Data are presented to show what correlation, if any, exists between phloem condition and phloem moisture content in Elm logs and attractiveness to *Scolytus multistriatus*, as reflected by the number of oviposition tunnels.

The rate of decadence of the phloem is closely correlated with the entry of beetles for egg-laying whereas moisture is apparently not a deciding factor. Only small numbers of *S. multistriatus* entered logs in which all the

phloem was dead; and in no case was entry made into phloem which had been dead for more than a month. There was no significant difference between live and decadent phloem in the number of beetle entries.

Data for *Hylurgopinus rufipes* show relationships similar to those described for *Scolytus multistriatus*. *H. rufipes* was observed to enter dead phloem a little more frequently, but it also generally preferred live and decadent phloem. The larvae of *H. rufipes* showed better survival in dead phloem than did those of *S. multistriatus*.

[1321]. 45.3 : 12.29 : 13.2 : 45.4. MYERS, G. **Insects and mites recorded from Bamboo in the United States, with records of their distribution and food plants in foreign countries.** Insect Pest Survey, U.S. Bureau of Entomology and Plant Quarantine: *Special Supplement* No. 2, 1947. pp. 10.

47. INJURIES OF ALL KINDS TO INDIVIDUAL TREE SPECIES

See also *For. Abstr.* 9 (Nos. 808, 1197, 1310).

[1322]. 47 : 12.25 : 11.34. **The silviculture and pathology of European Larch.** *Rep. imp. for. Inst. 1945–46*, 1947 (15).

There is no true correlation between the incidence of Larch canker and die-back and the occurrence of insect pests such as the Larch shoot moth or leaf-miner or the leaf-sucking *Adelges*. In European Larch planted on old Oak woodland, it was found that, contrary to common belief, canker and die-back may be very severe and that their severity is related to topographical factors.

[1323]. 47 : 12.25. **The dying of Scots and Corsican Pines in East Anglia.** *Rep. imp. for. Inst. 1945–46*, 1947 (14).

There is strong evidence that the fundamental causes of this serious mortality are to be found in the very great variations in soil conditions, and especially in the balance of water and air in various layers in the soil. Part of the evidence lay in the discovery of abnormal zones in the root wood of affected trees [cf. *For. Abstr.* 8 (No. 1373)]. Another part of the evidence lay in the nature of the height-increment curves for Pines in and near the affected areas.

[1324]. 47 : 12.26–8 (7) : 45.3 : 13.2. HANSBROUGH, J. R. **A pathological program of research on the cause of Birch dieback.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 917 (F–3), 1947. pp. 3.

[1325]. 47 : 12.26–8 (716). HAWBOLDT, L. S. **Aspects of Yellow Birch dieback in Nova Scotia.** *J. For.* 45 (6), 1947 (414–22).

A general review of the problem of die-back precedes an account of investigations in Nova Scotia on possible pathogens and on root conditions. [Cf. *For. Abstr.* 8 (No. 1459).]

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

[1326]. 52 : 12.26–8. WOLFENBARGER, D. O. **Estimations of volumes, surface areas, and numbers of twig crotches in Elm trees.** *Amer. Midl. Nat.* 34 (2), 1945 (421–32).

Cubic-volume contents and surface areas of the bark of Elm trees were found to be similar in trees of the same size irrespective of site. Volume contents and surface areas were directly related to the diameter of trees at breast height through transformations of the two variables to logarithms. Average rates of increase in volume contents and surface areas of trees in terms of logarithms, were 2·5699 and 2·0747 respectively, per logarithmic unit increase of tree d.b.h. Tables are given showing the average number of twig crotches in Elm trees of different diameters. The numbers of twig crotches in small Elm trees were found to vary so widely on different sites that no general average could be usefully made. *From author's summary.*

52.3. *Form. Taper*

See also *For. Abstr.* 9 (No. 1333–4).

[1327]. 52.3 : 52.1. **Is stump diameter important?** *Rep. Ntheast. For. Exp. Sta. 1945–6*, 1947 (30–1).

The relation of stump diameter to d.b.h. has been worked out for the principal commercial species of the anthracite region of Pennsylvania and is presented in a series of curves. White Oak (*Quercus alba*) has the greatest degree of taper from stump to breast height and Black Cherry (*Prunus serotina*) the least.

52.4. *Measurement of Volume*

See also *For. Abstr.* 9 (No. 808).

[1328]. 52.43 : 12.25 (931). McKINNON, A. D. **A comparison of methods of determining the cubic volume of standing Kauri.** *N.Z. J. For.* 5 (3), 1946 (225–9).

The relative accuracy of the current method of measuring standing Kauri (the centre-girth method) was examined. A sample of 164 trees, ranging in g.b.h. from 8 ft. 8 in. to 19 ft. 11 in. and in merchantable height from 22 ft. to 70 ft. showed a negative aggregate difference of — 7·1 per cent. by the centre-girth method, as compared with true volume determined by measuring each tree in short sections. With one exception all trees showed a negative percentage difference from true volume, the difference decreasing with increasing height and g.b.h., the mean percentage difference being — 7·85 per cent.

A local Kauri volume table was prepared from these same trees which, checked against the basic data, showed an aggregate difference of + 0·3 per cent. and a mean deviation of ± 6·93 per cent.

The recommendation is made that the centre-girth method be abandoned and be replaced by either volume table or log scaling. *Author's summary.*

[1329]. 52.43 : 22.82.1. GAUDIO, F. S. DE. Confronto tra i metodi di cubatura applicati alle fustaie coetanee. [**Comparison of different methods of volume measurement applied to even-aged stands.**] *Riv. for. ital.* 2 (8/9), 1940 (49–57). [It.]

The methods considered are (1) empirical volume tables, (2) form factors, (3) single sample tree, (4) mean tree, (5) site index, (6) form height, and (7) the Metzger formula. The results of applying these methods to the same stand are set out in tabular form and discussed. The average percentage of error compared with volume table results varied between 0·5 for Draudt's formula for mean-tree method to 26·7 for single-sample-tree method. All errors were positive except that for Urich's mean-tree formula (— 0·44).

[1330]. 52.43.2 (44) : 32.3. VENET. L'estimation des grumes. [**Scaling and sorting logs.**] *Les techniques du bois* 1, 1947 (60–8). [F.]

An account of the French standards adopted in 1941 by the Association Française de Normalisation, and their application in practice. [Cf. *For. Abstr.* 9 (No. 1174).]

[1331]. 52.43.2 (44) : 33.91. Bois; cubage des bois débités. [**Wood; mensuration of converted timber.**] *Norme franç.* No. B53–016. 1946. pp. 8. [F.] B.S.I.

[1332]. 52.43.3 : 56.04. MARTINI, M. DE, and PALOPOLI, D. Studio per la compilazione di tavole stereometriche e determinazione della massa legnosa in un bosco maturo al taglio. [**Study on the compilation of volume tables and the determination of the volume of wood in a mature wood ready to cut.**] *Riv. for. ital.* 5 (1/2), 1943 (7–14). [It.]

Describes the construction of volume tables for use in determining volume by the formula $v = f(d) = ad^2 + bd + c$, where v is the mean tree volume, d is diameter at breast height, and a, b, and c are constants dependent on the nature of the stand (species, management, aspect, extent, density, etc.). In the second part of the article, the authors show that the formula can also be used to estimate annual and current increment, and they demonstrate that there is a perfect analogy between the rate of acceleration of increment and the rate of acceleration of a falling body.

[1333]. 52.43.3 : 12.25 (498) : 52.3. TOMA, G. T. Tabele de cubaj și coeficienți de formă pentru molidul din munții Călimani. [**Volume tables and form factors for Spruce from the Călimani mountains.**] *An. Inst. Cerc. Exp. for., Bucuresti (Ser. I)* 6, (1940) 1941 (82–108 + chart). [Rum.g.] P.R.

[1334]. 52.43.3 : 12.25 (791). **Ponderosa Pine volume tables.** *Rep. Sthwest. For. Range Exp. Sta. 1946*, [?1947] (41–2).

An experiment was made to determine how far the form-class tables recently issued by the U.S. Forest Service for use on eastern hardwoods and southern hard- and softwoods were applicable to south-western Ponderosa Pine. The volumes of 184 felled trees were measured and compared with volumes obtained from the form tables and from Region 3 tables and south-western Experiment Station tables. The volumes obtained by the form tables averaged 17 per cent. in excess of scaled volume, compared with 9·5 and 3·4 per cent. respectively

for the other tables. The estimates were consistently high for all trees containing more than one log, indicating that upper-log tapers are higher than those used in the tables.

[1335]. 52.43.3 : 12.26–8 : 22.2 (45). CRIVELLARI, D. Tavola stereometrica delle matricine di leccio di alcuni forteti della Maremma Toscana. [**Volume table for Holm Oak coppice in the bush country of the Tuscan Maremma.**] *Ital. for. mont.* 2 (3), 1947 (131–9). [It.]

The author explains the construction by statistical method of a volume table for the dense coppice growth of *Quercus ilex* which occurs in the Maremma and compares the figures so obtained with those obtained by using a table based on Hohenadl's formula, and on scaled (i.e. weighed) volume.

[1336]. 52.43.4 : 52.1. BENASSI, L. Calcolo del diametro medio delle piante di una fustaia coetanea con metodo approssimato. [**Calculation of mean diameter of the trees in an even-aged stand by method of approximation.**] *Ital. for. mont.* 2 (3), 1947 (164–5). [It.]

The method expounded is based on Weise's theorem that the mean diameter of the trees of an even-aged stand occupies the same position in an increasing series as $\frac{60}{100} \times n$, where n indicates the total number of stems. The method is to construct a table with three columns, (1) d.b.h. arranged by 2-cm. classes in ascending order, (2) number of trees, (3) basal area. Then, using the above formula, to determine within 4 cm. the position in the scale of the mean diameter, and the diameter itself is then obtained by calculating first the mean basal area and then the corresponding diameter.

56. INCREMENT

See also *For. Abstr.* 9 (Nos. 920, 1332).

[1337]. 56 : 21.6 : 12.11 : 11.44. MØLLER, C. M. **The effect of thinning, age, and site on foliage, increment, and loss of dry matter.** *J. For.* 45 (6), 1947 (393–404).

The author summarizes the results of his investigations which are reported fully in a Report of the Danish Forest Experiment Station of which an extensive abstract appeared in *Forestry Abstracts* 7 (No. 2096).

[1338]. 56.02 : 11.21 (711 : 711.1). SCHULMAN, E. **Dendrochronologies in southwestern Canada.** *Tree-ring Bull.* 13 (2/3), 1947 (10–24).

Preliminary field sampling by the writer in 1943 had yielded fairly sensitive ring series in *Pinus ponderosa* and *Pseudotsuga taxifolia* of north-central Washington and southern British Columbia. During September, 1944, a number of dry-type forest stands in British Columbia and at Banff National Park were sampled and are here reported. Ring records were found in both Douglas Fir and Ponderosa Pine, which, in quality of cross-dating and sensitivity, approximated to that of the better series from the Colorado basin.

[1339]. 56.02 : 11.31 : 12.25 (712 : 798) : 55. GIDDINGS, J. L. **Mackenzie River Delta chronology.** *Tree-ring Bull.* 13 (4), 1947 (26–9).

Stands of White Spruce (*Picea glauca*) found growing on the Mackenzie River Delta above latitude 67° N. include trees more than 500 years old. Many of the trees sampled have some degree of centre rot, as is also found with trees along the timberline in Alaska. Average ring width does not generally decrease with age, but long-period growth suppressions and releases occur, which are not apparently correlated with climatic fluctuations. It is noteworthy that White Spruce growing in the less severe conditions further up the river, do not attain this great age, trees of more than 200 years being exceptional, and have a pronounced age curve. The same contrast is observed at the latitude barrier in Western Alaska and at the timberline on mountains in the interior of Alaska. Longevity in trees at northern extremes seems to be linked with the climatic stress of temperature, excessive twist in stem, thinner average annual ring, and a reinforced, stocky trunk.

[1340]. 56.02 : 22.14.1. PRODAN, M. Der Stärkezuwachs in Plenterwaldbeständen. [**Diameter increment in managed selection forest.**] *Schweiz. Z. Forstw.* 98 (7), 1947 (275–88). [G.g.f.]

Making use of data derived from an experimental plot of ½ ha. in which all the trees are numbered and were periodically measured from 1936 to 1942, the author establishes a formula for discovering the diameter increment of different diameter classes in managed selection forest, which can be applied by the practising

forester to the data he has normally available. The formula ($z_d = -0{\cdot}1690 + 0{\cdot}220$ (d.b.h.) $- 0{\cdot}00205$ (d.b.h.)^2 represents a curve of parabolic form, and values for z_d (diameter increment for a given diameter class) can be obtained either from the formula or graphically from the curve. For very small areas ($\frac{1}{2}$ ha. and less) 1- to 2-cm. classes must be used, but for larger areas 4- or 5-cm. classes give good results.

[1341]. 56.04. GAUDIA, F. S. DE. Sulla determinazione dell'incremento percentuale di volume degli alberi in piedi con la formula di Wally. [**The determination of volume increment per cent. by Wally's formula.**] *Riv. for. ital.* 4 (4), 1942 (43–4). [It.]

Describes the use of the formula $pv=pg+Z$, where pv is volume increment per cent., pg is basal-area increment per cent. and Z is a constant for a given species, varying with age and height. Methods of determining Z are discussed and a table is given of its values for Silver Fir at ages from 60 to 100 years and heights of 18 to 34 m.

[1342]. 56.04 : 12.25 (931). MCKINNON, A. D. **Increment of Kauri (*Agathis australis*).** *N.Z. J. For.* 5 (3), 1946 (230).

Data on merchantable volume and increment per tree, based on 50 trees up to 500 years old, grouped into 50-year age classes.

[1343]. 56.04 : 12.25 (45) : 52.43.3 : 21 : 47 : 3 : 23.3. GIORDANO, G. Produzione e caratteristiche del legname di pino uncinato. [**Yield and characters of the wood of Mountain Pine.**] *Riv. for. ital.* 2 (8/9), 1940 (27–40). [It.]

Mainly a discussion of volume increment of *Pinus mugo* var. *rostrata* in the Piedmontese Alps, illustrated by graphs and tables. There are also short sections on silvicultural treatment, damage and diseases and rather longer ones on utilization and afforestation. [Cf. *For. Abstr.* 9 (No. 808).]

[1344]. 56.2 : 12.25. MUNGER, T. T. **Recent growth records of Douglas Fir stands.** *For. Res. Notes Pacif. Nthwest. For. Range Exp. Sta.* No. 34, 1946 (9–10).

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

See also *For. Abstr.* 9 (Nos. 830–1).

[1345]. 57.4 : 52.43.5. BICKERSTAFF, A. **The measurement of growth on forest areas by means of recurrent line plot surveys.** *For. Chron.* 23 (1), 1947 (36–43).

The main points brought out in a discussion of technique for recurrent line-plot surveys for the study of growth were (*a*) Permanent rather than temporary plots should be established. (*b*) Increment should be computed on an individual plot basis instead of by taking the difference in average yield between one measurement and the next. (*c*) Large errors in increment may occur unless all 4 corners of permanent plots are definitely and permanently marked on the ground. (*d*) Much greater care is required in tallying plots for growth studies than for inventory purposes. (*e*) All compilations of remeasurement data must use the same methods, volume tables and comparable height-diameter curves as the original measurements. (*f*) Size of plots should be based on size and variability of timber sampled; under many conditions, one-fifth-acre plots appear most suitable. (*g*) The number of plots used depends on the required accuracy and variability of stands sampled; not fewer than 20 plots should be used for a given average if a standard error of less than 10 per cent. is required. (*h*) Compilation of volume, etc., should be done on an individual plot basis, since much summarizing is thus obviated and the data are more easily rearranged. *Author's summary.*

6. MANAGEMENT. WORKING PLANS. SURVEYS

See also *For. Abstr.* 9 (No. 807).

60. GENERAL LAND MANAGEMENT

60.2 *Management of Tree Plantations under Non-Forest Conditions*

[1346]. 60.2 (45) : 22.22 : 22.23. TIRABOSCHI, G. Le alberate lombarde e loro produttività. [**The plantations of Lombardy and their productivity.**] *Riv. for. ital.* 2 (11/12), 1940 (14–21). [It.]

An account of the tree plantations along roads, canals, etc., in the irrigated plains of Lombardy. The species most generally planted are Planes, Poplars, Willows and Alders. Planes are particularly satisfactory for this

purpose as their leaves provide a profusion of litter and they are very little subject to disease. A comparison was made of the production of wood by Planes under pollarding and coppicing respectively and it was found that the ratio was 5·7 : 1 in favour of pollarding; in addition to which, this method has the advantage of producing posts as well as faggots. Taking into account the shorter interval between successive coppicings and the closer planting, the overall ratio between the two methods is 8 : 5 in favour of pollarding. The alleged damage to field crops by hedge trees is discussed.

60.3 *Management of Different Classes of Forest*

[1347]. 60.31.2 : 06.6. KOROLEFF, A. **Practical woodlot management. How to use the forest soundly and profitably.** Canadian Forestry Association, Montreal. 1946. pp. 61. [E.]

A practical handbook designed to make the farmer conscious of the need to manage his woodlot, and to instruct him how to do it. Illustrated.

[1348]. 60.31.2 (54) : 24.4. GRIFFITH, A. L. **Farm forestry.** *Indian For.* 73 (5), 1947 (206–11). [Seventh All-India Silvicultural Conference, Dehra Dun (1946).]

Notes on shelterbelts, live fences and plantations raised in farm land to supply the agricultural community with fuel, small timber, fodder, etc. The author reviews certain publications and discusses their applicability to Indian conditions. A list of species suitable for live fences is included.

[1349]. 60.31.2 (775) : 22.15 : 23.26 : 43.1. **NEPCO forest management program.** *Paper Ind.* 29 (3), 1947 (368–71). P.R.

An account of a reforestation and forest management plan which is being conducted by the Nekoosa-Edwards Paper Co., Wisconsin, with the object of supplying their own pulpwood requirements. A short description is given of the Company's nurseries and their forest planting, fire protection and cutting methods.

61. SURVEYING. MAPPING

[1350]. 61.3 (67). RENDLE, B. J. **Co-operative research in the development of the Empire's timber resources.** H.M. Forestry Commission, London. 1947. pp. 7. [5th British Empire Forestry Conference, Great Britain, 1947.]

In view of the importance of tropical Africa as a source of timber, there was initiated shortly before the war a project for a comprehensive survey of the timbers of this region. An account of the project was published in the Empire Forestry Journal in 1943 [cf. *For. Abstr.* 5 (180)] an abridged version of which is appended to the present paper. The project is now being actively carried on in collaboration between the various colonial Forest Departments and the Forest Products Research Laboratory, Princes Risborough.

[1351]. 61.3 (931). THOMSON, A. P. **The national forest survey in New Zealand.** State Forest Service, Wellington, N.Z. 1947. pp. [9]. [5th British Empire Forestry Conference, Great Britain, 1947.]

Vertical air photographs at a scale of 4 in. to 1 mile are the basis for a comprehensive forest survey at present being undertaken by the New Zealand State Forest Service. Type boundaries are marked on the photos. The types may have reference to differences either in plant association or in volume per acre within the same association. Sampling for volume per acre is done by a systematic line-plot survey using rectangular one-acre plots. Detailed botanical and ecological data are recorded for a certain proportion of each plot. Final results will give total volume estimates by species and by diameter classes for major forest regions. Figures will be obtainable for that proportion of the total volume which is considered merchantable by present-day standards. *Author's summary.*

[1352]. 61.3 (931) : 61.31. THOMSON, A. P. **Design for a forest survey.** *N.Z. J. For.* 5 (3), 1946 (191–99).

See preceding abstract.

[1353]. 61.3 (97). **Report of the committee on the survey of resources.** In *Fifth British Empire Forestry Conference, Great Britain, 1947: Summary Report.* 1947 (36–8). H.M. Stationery Office, London.

After recapitulating resolutions on this subject made at previous Conferences, the report goes into the problems of collection, co-ordination and dissemination of facts as to the

existing state of forests. It is considered that from studies of aerial photographs and maps it should be possible to reduce sampling areas to a minute fraction of what would otherwise be necessary, and that with a reasonable degree of determination, enterprise and organization, all countries should be able within the next 10 years to complete a national inventory with acceptable standards of accuracy. Some research on sampling methods may be necessary for some areas.

It is recommended that a small technical committee with a permanent secretary should be set up in the United Kingdom for the purpose of co-ordinating definitions of types and ensuring the greatest practicable degree of uniformity. This committee should be responsible, *inter alia*, for the following:— (1) Guidance as to photographic scales. It is noted that current practice varies from $\frac{1}{80000}$ for the Colonial territories to $\frac{1}{10000}$ in Europe. The former scale should be satisfactory for this preliminary survey. (2) Scale of maps. (3) Degree of accuracy and the necessary intensity and class of ground assessment in various forest types. It is suggested that an error of 5 per cent. in areas and even up to 35 per cent. in volumes is preferable to not getting the work done at all. (4) Determination of the class of ancillary information which shall be collected by ground assessment parties. (5) Standard forms for the presentation of data, including co-ordination of type-descriptions and relevant definitions such as 'availability'. (6) Advice and assistance to forest authorities on qualifications and duties of technical staff required for the interpretation of air photographs. Though in the initial stages it may be necessary to employ skilled interpreters of air photographs rather than forest officers, it should be the aim of all forest authorities to train forest officers specially for this work, particularly as subsequent flying and mapping to larger scales (for management purposes) will make their employment imperative.

The Conference adopted the report of the Committee and calls the attention of governments of the Commonwealth to its recommendations.

[1354]. 61.32 : 02.1. HART, C. A. **Air photography applied to surveying.** Longmans, Green & Co., London. 2nd ed., 1943. pp. xx + 366 + plates. Price 25*s*.

[1355]. 61.32 : 02.1. CHURCH, E. **Elements of aerial photogrammetry.** Syracuse University Press, Syracuse, New York. 1944. pp. 95 + plates.

[1356]. 61.32 : 02.1. MCCURDY, P. G., *et al.* [Editors]. **Manual of photogrammetry. (Preliminary edition.)** Pitman Publishing Corporation, New York. 1944. pp. ix + 841.

[1357]. 61.32 (71). SEELY, H. E. **Some developments in the use of air photographs for forest surveys.** Dominion Forest Service, Ottawa. 1947. pp. 7. [5th British Empire Forestry Conference, Great Britain, 1947.]

A brief sketch of the methods of aerial survey in use by the Dominion Forest Service. Some of the recent developments touched on are the reproduction of maps in full colour at a very cheap rate by a process of photolithography and a photo-electric planimeter which will measure irregular areas by the aid of photo-electric cells and an ammeter.

[1358]. 61.32 : 07.7. **Precision aerial mapping.** *Timberman* 48 (10), 1947 (78, 80, 100).

Description of Multiplex, an aerial mapping instrument, and its adaptation to the mapping of forest. It is manufactured by the Bausch and Lomb Optical Co., Rochester, N.Y.

[1359]. 61.32. HUSCH, B. **A comparison between a ground and an aerial photogrammetric method of timber surveying.** *Abstr.* in *J. For.* 45 (7), 1947 (491). [New York State College of Forestry, Syracuse 10, N.Y.]

Abstract of a thesis deposited in the Library of the New York State College of Forestry. A timber survey from vertical aerial photographs was compared with conventional ground timber survey for a typical Adirondack northern hardwood stand. A topographic and type map and a timber estimate were first prepared by field methods, and then from aerial photographs. The maps from the latter were prepared by means of a radial plot, the Abrams Contour-Finder, and the Saltzman reflecting projector. The aerial timber estimate was based on the photographic measurement of

visible crown diameters of individual trees. Aerial photographic volume tables were prepared using the single variable, visible crown diameter. The effects of scale and topographic relief displacement on the photographic measurements were recognized. Comparisons were then drawn between the results of the two surveys. Required times for all phases of the two surveys were noted. The method of aerial photographic timber surveying proved entirely feasible. Modifications to increase accuracy are suggested.

[1360]. 61.32 : 52.43.5. HARTMAN, F. J. **A simplified method for locating sample plots on aerial photographs.** *Sta. Note Ntheast. For. Exp. Sta.* No. 3, 1947. pp. 3.

The method uses transparent celluloid templates, so as to prevent the concentration of sample plots on the higher elevations, which is apt to occur where differences in relief are great, since mountain and ridge tops appear on the photographs on a larger scale than the valleys and lowlands.

[1361]. 61.32 : 65.7 : 07.7. MOESSNER, K. E. **A crown density scale for photo interpreters.** *J. For.* 45 (6), 1947 (434–6).

The scale consists of 3 columns of squares containing black dots, with the area covered by the dots varying between 5 and 95 per cent. of the square. The original scale drawing was prepared on squared paper having 100 squares to the sq. in. and dots occupying $\frac{1}{100}$ sq. in. were centred in certain of these squares. The distribution of dots in the two outside columns was determined from a book of random numbers, while those in the centre column were mechanically spaced.

The 1-in. squares were photographically reduced to represent one acre at the scale of the aerial photographs in use; at this scale, the dots within them approximate to the crown size of mature trees in the region (Central States Forest Experiment Station). To use this scale in estimating the percentage of crown closure or density, the interpreter places his photographs under the stereoscope and lays the scale under one eyepiece alongside the plot to be examined. He then slides the scale up and down till he reaches the density most resembling the plot under observation. He then records this crown density either by 10-per-cent. classes or broader groups. The examination must be made under a stereoscope, since the crowns and their shadows will be confused on a single photo. Experiments in the use of this device showed that it is quicker, cheaper and more accurate than area computation or dot counts; little training is required and good estimates are possible even with inexperienced men. The scale is illustrated with a typical photo.

[1362]. 61.32. GRIFFITH, A. L. **Further notes on aerial reconnaissance for forest officers.** *Indian For.* 73 (6), 1947 (237–40 + plates).

Cf. *For. Abstr.* 8 (No. 1496). A reconnaissance was made in order to see the state of the forests in the catchments of the Amb-Chilas-Gilgit area of the Indus basin, high and difficult country. The flight was made in an Anson and the camera used was a 9 × 12 cm. folding Zeiss Ikon with a film-pack adaptor. The greater part of the flight was done at an elevation of 9,000–10,000 ft. with the river flowing below at 3,000–4,000 ft. and the mountains above at 10,000–15,000 ft. Cruising speed was about 125 m.p.h. A combination of such aerial reconnaissance and photography with ground inspection gives information in a short time that would take many months to collect on the ground alone. Notes are given on the photographs reproduced.

62. COMMUNICATIONS

[1363]. 62 (945). WESTE, G. **Radio communication in Victoria.** *Aust. For.* 10, 1946 (41–6).

An account of the system built up by the Victorian Forests Commission primarily as an aid in fire-fighting and secondarily as a means for rapid administration. It consists of 3 main divisions—(1) Local, short-range systems composed of specially designed portable units, used mainly in isolated areas. The R.C.16 portable radiophone is described. Working is usually reliable up to 30 miles with a tree-slung, single-wire aerial; on permanent or semi-permanent stations the horizontal, half-wave aerial is used and works up to 200 miles. (2) A fixed network of base stations. (3) The central system at Melbourne. Details of equipment and working are given.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

74. VALUE OF THE STAND. VALUE OF THE FOREST

[1364]. 74 : 22.2 : 22.11 : 22.14. BAY, E. Considerazioni economiche sui boschi da taglio raso. **[Economic aspects of clear-cut woods.]** *Riv. for. ital.* 5 (3/4), 1943 (62–5). [It.]

A comparison of the economic aspects of selection forest and clear-felled coppice. The latter system enables the cost of reforestation to be disregarded. The capital value of growing stock, capital value of the land and capital value of growing stock plus land, are calculated and compared for the two systems of management.

[1365]. 74.2 : 31.8 : 12.26–8 (943). ELLIS, C. **An approach to the question of the true stumpage residuals of hardwood logs of varying pipes.** *Aust. Timb. J.* 13 (5), 1947 (303, 305, 307, 309, 311).

The Queensland Forestry Department rarely sells hardwood logs direct at the market price, but charges stumpage alone to the sawmiller, who arranges for his own felling and hauling. Millers are not required to limb, crosscut and haul defective logs, but if such logs are removed they are charged at half stumpage rates. The present study is an attempt to determine what should be the limits of defect in compulsorily removeable logs chargeable at full and at reduced rates.

Two formulae have been arrived at from an examination of figures of costs obtained in the course of hardwood mill studies in Queensland:

(A) Total wages costs of conversion of any log

$$= 23{\cdot}4 + 0{\cdot}002056\, G^2L \text{ pence}$$

and

(B) Sawn output for any log

$$= -29 + 0{\cdot}003420\, G^2L - 0{\cdot}332\, P^2L \text{ super. ft.}$$

where G = girth in inches, L = length in ft., and P = pipe (i.e. extent of heart rot) in inches. Using these formulae, it is shown that it is possible to construct a series of tables or graphs showing the wages cost per 100 super. ft. net sawn, solid timber and the mill-door log value and total extraction costs, for any combination of girth and pipe. The value of true residual stumpage can be obtained by subtracting total cost from mill-door log price. [Cf. *For. Abstr.* 9 (No. 1064).]

8. FOREST ADMINISTRATION

81. ORGANIZATION. REGULATION OF SERVICE

[1366]. 81 (52). VARNEY, R. M. **The position of a forester in Japan.** *J. For.* 45 (7), 1947 (483–91).

Deals with the system of Japanese public administration, and particularly with the evils resulting from the occupation of all higher posts by professional administrators rather than technicians.

[1367]. 81 (541) : 90 : 09.1. SMITH, H. P., and PURKAYASTHA, C. **A short history of the Assam Forest Service, 1850–1945.** Govt. Press, Shillong, Assam. 1946. pp. ii + 102.

9. FOREST POLICY

[1368]. 9 : 06.2 : 98.1 : 98.3. LELOUP, M. Les problèmes forestiers mondiaux. **[World forest problems.]** *Rev. Bois Appl.* 2 (4), 1947 (27–31). [F.] P.R.

The inaugural speech of M. Leloup, director of forests and forest products of FAO, given at the International Conference at Mariánské Lázně in April, 1947.

The problem of the great reduction of timber imports into importing European countries at a moment when their needs are most pressing is considered. In 1937 countries of Europe and the Mediterranean area imported 6 million standards, whereas in 1947 they will not receive even 3 million. The problem has its source in questions of forestry,

and only a far-sighted forestry policy can solve it. For this reason the situation must be discussed by both importing and exporting countries. Both economy in consumption and an increase in production must be effected. For present and urgent needs more extensive cutting in Europe is the most likely solution, for, in spite of war damage, many years of careful management have rendered this still possible without disaster. Rational exploitation of hitherto untouched forest areas and technical improvements in forest industries are also recommended. The formation of three committees is suggested, two of which would study needs for 1947 and 1948, while the third would deal with consumption and production trends from 1949 to 1960.

[1369]. 9 : 06.2 (97). CHAMPION, H. G. **Relations of Empire forestry with the United Nations Food and Agriculture Organization.** H.M. Forestry Commission, London. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

90. GENERAL PRINCIPLES OF FOREST POLICY

[1370]. 90 (410) : 92. TAYLOR, W. L. **Forest policy and legislation in Great Britain.** H.M. Forestry Commission, London. 1947. pp. 4. [5th British Empire Forestry Conference, Great Britain, 1947.]

A short account of Royal Commissions and legislation dealing with forestry from 1909 to the present time.

[1371]. 90 (431–5). POOLE, A. L. **Some aspects of German forestry.** *N.Z. J. For.* 5 (3), 1946 (183–91 + plate).

[1372]. 90 (495). **Report of the F.A.O. mission for Greece.** Food and Agriculture Organization of the United Nations, Washington, D.C. 1947. pp. xi + 188 + map.

Suggests the lines along which forestry research in Greece should develop, and recommends an immediate reforestation project with the primary object of preventing erosion and silting of irrigation and drainage canals, and a survey of forest resources as the basis for a long-term forestry programme.

[1373]. 90 (681 : 686). MILLER, O. B. **Forestry aims in the African High Commission territories.** Forestry Office, Pharing. 1947. pp. 12. [5th British Empire Forestry Conference, Great Britain, 1947.]

[1374]. 90 (711) : 92. ORCHARD, C. D. **Forest policy and legislation in British Columbia.** British Columbia Forest Service. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

[1375]. 90 (728.2) : 33. LAMB, A. F. A. **The influence of modern trends in timber utilization on silvicultural policy in British Honduras.** [? Forest Department, Belize.] [?1947.] pp. [4] + map. [5th British Empire Forestry Conference, Great Britain, 1947.]

The past history of timber cutting in British Honduras is related to present knowledge of growth increment and remaining stocks in virgin stands. The recent trends of timber utilization are mentioned and their influence on the progress of silviculture of the colony is reviewed. From this a general silvicultural programme for future development in each of the three areas defined is drawn up. *Author's summary.*

[1376]. 90 (73). WATTS, L. F. **The forest situation in the United States.** U.S. Forest Service, Washington. 1947. pp. 6 + tbls. [5th British Empire Forestry Conference, Great Britain, 1947.]

91. SOCIAL AND ECONOMIC INFLUENCE OF THE FOREST. FOREST INFLUENCES

[1377]. 91. **The forest, forestry and man.** Empire Forestry Association. 1947. pp. 68 + plates. [5th British Empire Forestry Conference, Great Britain, 1947.]

A brief exposition of the historical background and scientific basis of forestry, and a short review of the world and empire timber position in the present and the prospects for the future, prepared by the Empire Forestry Association.

[1378]. 91.3 : 016 : 11. MOREY, H. F. [Compiler]. **More important publications dealing with forest influences, issued 1939–1945.** U.S. Forest Service. 1946. pp. 9.

Cf. also *For. Abstr.* 9 (Nos. 732 *et seq.*).

92. FOREST LAW

See also *For. Abstr.* 9 (Nos. 1251, 1370, 1374).

[1379]. 92 (485). TILLANDER, T., ROS, V., HERLITZ, N., *et al.* Förslaget till ny skogsvårdslag: föredrag vid Svenska Skogsvårdsföreningens årsmote; diskussionsinlägg. [**The proposed new forest conservation law: lectures and discussion at the annual meeting of the Swedish Forestry Society.**] *Svenska SkogsvFören. Tidskr.* 45 (2), 1947 (77–121). [Sw.] Cf. *For. Abstr.* 8 (No. 1537).

[1380]. 92 (569). PALESTINE. **List of protected trees under Forest Ordinance: part V, section 14 of Forests Ordinance, cap. 61.** [Govt. Printer, Palestine.] 1947. p. 1.

[1381]. 92 (786). MONTANA. **Laws of Montana relating to forestry and State parks.** Office of the State Forester, Forestry School Building, Montana State University, Missoula, Montana. 1946. pp. 88.

[1382]. 92 (86). COLOMBIA. [**Nine decrees and regulations of the Ministry of National Economy dealing with forest conservation and exploitation.**] *Tierras y Aguas* 8 (85/90), 1946 (507–51). [Span.]

[1383]. 92 (86). COLOMBIA. Ultima ley sobre terrenos baldios (97 de 1946) y su decreto reglamentario. [**Latest law relating to waste lands (97 of 1946) and the decree enforcing it.**] *Tierras y Aguas* 8 (91), 1946 (555–67). [Span.]

[1384]. 92 (946). HELMS, A. D. **Forestry legislation in Tasmania, 1946.** *Aust. For.* 10, 1946 (17–21).

93. FOREST RIGHTS, CONCESSIONS AND PRIVILEGES

[1385]. 93 : 35. BERNARDI, S. Contributo allo studio del macchiatico—metodo grafico. [**Contribution to the study of 'macchiatico'—a graphic method.**] *Riv. for. ital.* 5 (3/4), 1943 (52–60). [It.]

'Macchiatico' is the price paid for the right of cutting brushwood. The value of the macchiatico (Pm) can be determined from the formula $Pm = K_1 Pv - K_2 S$, where Pv is the market price of a unit of brushwood, S is the cost of production of such a unit (cost of cutting, bundling, transport, insurance, etc.), and K_1 and K_2 are constants to be fixed for different species and localities. Directions are given for determining the value of K_1 and K_2, and for a graphic method of applying the formula.

94. FOREST OWNERSHIP. CO-OPERATIVES

[1386]. 94 (560) : 81. DAVIDSON, D. F. **State forestry in Turkey.** *For. Treasures* 4 (2), 1947 (16–18).

An account of the activities and methods of the recently reorganized Turkish State Forestry Service, its plans for afforestation of the bare central plateau and the establishment of village community forests. [Cf. *For Abstr.* 9 (No. 1394).]

[1387]. 94 (560) : 09.4. Orman sinirlama işleri. [**Work of the Forest Boundary Commission.**] *Orman ve Av* 15 (10), 1943 (253–5). [Turk.]

Out of a total of 9,443,157 ha. classed as forest in Turkey the State owns 4,574,384 ha., private owners 84,804 ha. and the Vakf (pious foundation) 128,200 ha.; 121,200 ha. were still in dispute in 1943. These figures are based on careful estimates but are not necessarily accurate, e.g. Istanbul province has 60,200 ha. of forests according to statistical records, but actually 133,000 ha. of forest exist.

[1388]. 94 (560). SAMYELI, M. Vakiflar, Vakiflarin orman kanunu ile alakasi. [**Forests of the Vakf and their laws and regulations.**] *Orman ve Av* 16 (7), 1944 (261–5). [Turk.]

The Turkish Vakiflar, or Pious Foundations, were created under ancient Islamic law. In 1844 they were brought under state inspection and a varying amount of control. Some of the irregular or obsolete charity foundations are now administered by the General Office of the Evkaf. Forests in such estates are, if necessary, brought under the State Forest Laws and managed by the State Forest Department. The legally constituted foundations came under the laws governing private forests, but where the beneficiaries or administrators lapsed, they reverted to the Evkaf Department.

Other categories which come under the laws for private forests are those perpetuated for special communities, such as Armenians, Greeks and Jews, or those for the benefit of a

trade, such as leatherworkers. These are managed by the administrators appointed in the foundation deed, but under the general supervision of the Committee of Management of the Evkaf. The General Director of the Evkaf is appointed by the Turkish Government and the Committee of Management, consisting of a President and three members with the General Director as *ex officio* member, is the supreme authority.

[1389]. 94.1 (560) : 09.4 : 12.19 : 34. KASAPLIGIL, B. Cenubî Anadoluda Devlet Orman işletmelerimiz, i; Güney Anadoluda Devlet Orman işletmelerimiz, ii. [**State forestry in southern Anatolia, I, II.**] *Orman ve Av* 17 (2; 3), 1945 (45–51; 93–97). [Turk.]

Of the 20 State forest districts the articles discuss 3—Osmaniye, 420,000 ha., Adana, 250,000–300,000 ha. and Mersin, 400,000 ha. In the Osmaniye district 268,000 ha. are classed as forest, of which 55,000 ha. are reserved, 57,000 ha. are subject to *baltalïk* (rights to cut timber and fuel) and the rest of the area, 156,000 ha., is almost wholly ruined. The chief species in the reserved forests are *Pinus nigra*, *P. brutia* and *P. halepensis* with *Abies cilicica*, *Cedrus libani* and *Juniperus* spp.; broadleaved species are *Ostrya carpinifolia*, *Carpinus orientalis*, *C. betulus*, *Fraxinus ornus*, *Populus tremula*, *Acer campestre*, *A. monspessulanum* and *A. hyrcanum*, *Sorbus torminalis* and *Quercus cerris*. In the rightholders' forests Oaks predominate—*Quercus cerris*, *pedunculata*, *hartwissiana*, *pubescens*, *infectoria*, *libani*, *coccifera* and *ilex*, with *Fagus orientalis*. There are large areas of maquis. Pine is the principal timber used, next Beech, then Oak. Of the minor products the chief is cork from *Q. cerris*, much of which goes to the Excise Department for the manufacture of bottle stoppers. Resin, Pine tar and Bay (*Laurus nobilis*) oil are important products.

In the Adana district about 80 per cent. of the forest area is ruined and 15 per cent. carries coniferous forest free of rights and with fair natural regeneration of *Pinus brutia*, *P. nigra* and *C. libani*.

The Mersin district has 80,000 ha. of reserved coniferous forest (*Pinus brutia* 80 per cent., *P. nigra* 10 per cent.), 150,000 ha. of Oak and broadleaved forest subject to cutting rights and 170,000 ha. of wasted forest. Minor products are *P. brutia* tar, which is sold mainly in Syria, pitch, and acorns of *Quercus cerris*, from which valonia is extracted.

Eucalyptus rostrata plantations were started in 1939 and now cover 600 ha. near Tarsus.

[1390]. 94.3 (410). WYNNE JONES, E. **Private forestry in Great Britain.** H.M. Forestry Commission, London. 1947. pp. 6. [5th British Empire Forestry Conference, Great Britain, 1947.]

An account of the Dedication Scheme followed by a short description of the extent and present condition of private woodlands in England, Scotland and Wales.

95. FOREST TAXATION

[1391]. 95.1 (410). HART, C. E. **Taxation of woodlands in England and Wales [up to and including the Finance Act, 1947].** Published by the author at 'Woodgate', nr. Coleford, Glos. 1947. pp. 9.

[1392]. 95.1 (485) : 74.2 : 65. STÅLFELT, F. De nya taxeringsvärdena för skogen: hur en skälighetsprövning kan utföras. [**The new values used in assessing forest taxes: how to make a check for equitableness.**] *Skogsägaren* 21 (4), 1945 (67–72). [Sw.]

[1393]. 95.3 (73) : 01.6. WATROUS, R. C., and BELL, F. C. **Forest credit in the United States, 1930–1945. A list of references.** U.S. Department of Agriculture Library List No. 23, 1946. pp. 10.

96. POLICY REGARDING PROTECTION FOREST, DEFORESTATION AND AFFORESTATION

[1394]. 96.5 (560) : 09.4. KAYACIK, H. Yurdumuzda Planli Agaçlandirmalara Başlarken. [**Beginning planned afforestation in Turkey.**] *Orman ve Av* 17 (4), 1945 (109–12). [Turk.]

The forest area in Turkey is 772,340 sq. km. (= 10 million ha.); of this over 2 million ha. are ruined forest, and there are villagers' rights over much of the remaining 8 million ha. The annual production of timber is 0·75 cu.m. per ha. whereas the demand is at least 1·7 cu.m. Afforestation with indigenous species is projected. [Cf. *For. Abstr.* 9 (Nos. 1386 *et seq.*).]

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

See also *For. Abstr.* 9 (Nos. 734 *et seq.*).

[1395]. 97 (729). SWABEY, C. **The development of forest policy in relation to agriculture in the Greater Antilles.** 1947. pp. 4. [5th British Empire Forestry Conference, Great Britain, 1947.]

The economy of the Greater Antilles is dominated by limited land areas, high population levels, dependence on agricultural industries, climate and topography favourable to soil deterioration. Protective forests are necessary and their location must be considered in the light of the agricultural practices in the region. The importance of protection of urban water supplies may necessitate modification of the general land-use allocation policy. Production forests must be confined to areas giving a higher average annual yield under forest management than under agriculture. The importance of local short-rotation forest crops is emphasized. Re-allocation of land-use may cause disturbance of local employment levels and this must be minimized. A combined programme of afforestation and improvement of agricultural practices is essential in order to ensure continuity of employment. *Author's summary.*

[1396]. 97.1 (97). **Report of the committee on land use.** In *Fifth British Empire Forestry Conference, Great Britain,* 1947: *Summary Report.* 1947 (33–5). H.M. Stationery Office, London.

After briefly reviewing the problems of land use, the report proceeds to make a number of recommendations. The Conference approved this report, and called the attention of the Governments of the Commonwealth to the recommendations contained therein, and particularly to the following:—(1) That there is urgent need for clear-cut planning based on the allocation of each type of land to the purpose for which it is best suited in the long-term interests of the national economy. Individual governments should enact legislation, where it does not already exist, for the establishment of a supreme land-use authority, having adequate forest representation, with directive at the highest level, and with the power and funds necessary to implement an approved land planning policy, based on suitable land-use surveys and supported by vigorous educational campaigns. (2) That further research into problems of land utilization and conservation and restoration of the soil should be carried out, and that adequate funds should be made available for the purpose. (3) That governments should take early steps to ensure that private or commercially owned forests and woodlands are managed in accordance with the principles of sound forestry. (4) That, in some countries of the Commonwealth, the encouragement of the practice of sound forestry on private, or on leased crown lands, will require adjustment of the incidence of taxation and conditions of tenure.

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The numbers in brackets indicate the reference number and date of publication of the periodicals, etc., to which the annotations refer.

Conferences. The International Union of Biological Sciences held its first post-war meeting at Copenhagen at the end of July. Delegates from 17 countries attended. It was agreed to form new sections for experimental cytology, embryology, genetics, microbiology and zoology (**17**; 4.10.47).

It is proposed in 1948 to hold a specialist conference of the Imperial Agricultural Bureaux, on tropical and sub-tropical soils with a view to formulating a system of classification and nomenclature. In preparation for the conference, colonial soil workers have been asked to prepare lists and descriptions of the commonly recognized soils of the areas in which they are working (**8**; 1946–47).

The following conferences are tentatively planned to take place in 1948. The Imperial Mycological Conference and The Imperial Entomological Conference, in London, probably in the summer; International Congress of Entomology, Aug. 9–14, at Stockholm; Congress of Geneticists, after Aug. 14, also at Stockholm. In 1949 it is hoped to hold the Fifth International Grassland Conference in the Netherlands; in 1950, the Seventh International Botanical Conference at Stockholm (**10**; 1947).

FAO. The Standing Advisory Committee for Forestry and Forest Products met in Washington, June 24–28, and made recommendations based upon the reports of sub-committees. The Committee agreed with the conclusion of the European Group of the Technical Sub-committee on Mechanical Wood Technology, that efforts to reduce wood consumption by using substitute materials miss the point of the long-range problem. The main task of FAO in the field of mechanical wood technology should consist in assembling information on economic uses of wood for construction and other purposes. Creation of a sub-committee on economic and statistical aspects of the chemical wood industry are recommended. A World Forestry Congress to be called in 1949 was proposed by the Advisory Committee. It was suggested that its programme should include urgent silvicultural problems connected with the development of virgin forests and the examination of standards of forest management, with special attention to recent advances in the sciences related to forestry. It was suggested that the projected forestry conference for Latin America should be called late in 1947 or early in 1948, and that a conference for the Far East should be called, if possible before the end of 1948 (**11**; 22.8.47).

Following an international Poplar week organized by the French Government, it was decided to set up an international Poplar Committee under the aegis of FAO (**22**; Aug.-Sept. 1947).

Australia. The Victoria Forests Commission has initiated a course of instruction for the training of ex-Servicemen as forest foremen, for whom there is increasing need. The course consists of 12 months' training in two sections as follows: (1) Six months' general instruction in theoretical and practical forestry at a central training school; (2) Six months' intensive practical training at selected

regional centres. All theoretical instruction is necessarily of an elementary character and is designed to provide the trainees with a background which will assist them to understand the principles governing the various works which they will later have to supervise. The syllabus comprises instruction in Botany and Forest Botany, elementary silviculture including plantation and nursery practice, fire protection, forest law, arithmetic and forest mensuration, surveying and forest engineering, forest products and their uses, industrial awards and conditions affecting forest employment, and office routine and correspondence. Trainees are also instructed in the handling and maintenance of motor vehicles, power pumps, etc., and take a course in first aid. For the second six months of the course, trainees will be segregated in groups and given specialized practical instruction in the type of work which they are likely to undertake when ultimately appointed as forest foremen. The main categories will be (i) men to be employed in nurseries and plantations, (ii) men to be employed in mountain forest districts, mainly on supervision of logging, sawmilling, road construction, and mountain fire protection, (iii) men to be employed in lowland and foothill forests. During the second half of the course, trainees will be attached in small groups to selected forest districts for training under district forest officers and their staffs (**4**; 1945–46).

The Victoria Forests Commission is now using its newly acquired Cograph mapping machine [cf. **For. Abstr.** 8 (p. 459)] to speed up surveying of forest roads. They are still testing a man-pack model of the machine, which is designed for a person walking, and maps on a scale of 2 in. to the mile as compared with 4 in. to the mile on the large caravan model. The latter is fitted with a time-saving device which shows at any time the exact height above sea level (**5**; June 1947).

The recovery of timber killed in the 1939 fires in Victoria continued during the year 1945–46 during which 129,565,000 super. ft. were milled, making a total of 1,059,774,000 super. ft. to date. Some of the logs dumped by the Commission and protected by water sprays since 1940 are to-day proving suitable for the manufacture of plywood veneer, a striking testimony to the effectiveness of the water-spray system (**4**; 1945–46).

Brazil. There are now several firms engaged in the manufacture of prefabricated houses. Wood is used throughout; with the exception of window frames and doors, which are made of Cedar [*Cedrela brasiliensis*] and Imbuia [*Phoebe porosa*], the material used is Parana Pine [*Araucaria brasiliana*]. This Pine is said to be brittle, and lighter and less resinous than North American Pine or Fir. All wood used in the houses is chemically treated against fungus, insects and fire (**13**; 2.8.47).

Canada. Canadian Boy Scouts who wish to obtain a forestry badge have to identify at least 15 native trees and 5 shrubs, describe the principal uses of 10 species of Canadian woods, successfully plant 12 trees, explain the aims of forestry and the effects of fire on soil composition, describe the general features of lumbering, discuss insect enemies of trees, and outline Government forestry activities in their province (**19**; July 1947).

Eire. The Irish Minister for Industry and Commerce on July 21, 1947, formally opened a peat-moss factory at Kilberry, Co. Kildare. It is hoped in the first year of production to produce 50,000 bales of moss, increasing in the next 3 years to 150,000 bales annually. The peat moss, which is obtained from the upper layers of approximately 3,000 acres of bog round Kilberry, is prepared in 3 grades: coarse litter, used primarily for stable bedding, and capable of absorbing several times its own weight in moisture; medium mull, used as a horticultural fertilizer; and fine mull, for packing and horticultural purposes. It is hoped eventually to export considerable quantities of the moss to the United States, where a ready market is thought to exist for it. [It is believed that the intention is ultimately to afforest the cut-over bog areas.] (**13**; 13.9.47).

France. The Comité national des Bois Coloniaux has recently resumed activity. One of the objects of the organization is the assembly of all the documentation relative to the utilization and preservation of tropical colonial timbers. A quarterly review, *Bois et Forêts des Tropiques*, will shortly appear (**21**; May 1947).

The Touring Club de France is organizing a competition for the composition of an elementary textbook designed for use in primary instruction, and particularly for children aged 12–14, with a view

to attracting them to the study of the forest. The title of the work is to be *La Forêt française* and it should have sections on utility, composition, exploitation, and other aspects of the forest. Prizes of 20,000, 10,000, and 5,000 frs. are offered. Full particulars can be had from the T.C.F., Comité pastoral et forestier, 65, Avenue de la Grande-Armée, Paris XVI (**22**; March 1947).

French Equatorial Africa. United States Plywood Corporation and the Compagnie française du Gabon are co-operating to erect in French Equatorial Africa what will be one of the largest plywood factories in the world. The quality of timber available for plywood production is exceptionally fine, the average diameter of the logs running from 4 to 6 ft. The predominant species is Okoumé or Gabon Mahogany [*Aucoumea klaineana*] (**23**; 1.2.47).

Great Britain. The Forestry section of the Federated Home Timber Associations is planning to assist in the rehabilitation of British woodlands by establishing nurseries, employing a mobile team of trained forest workers, and undertaking the draining, fencing, cleaning and planting of dedicated woodlands for private owners. Such an organization could undoubtedly create plantations at a much lower cost than the small grower. Silvicultural work will have to be done under professional supervision, and it is obvious that skilled advice of this nature can be obtained more economically where the forester is attached full time to a planting organization. (**24**; 20.9.47).

The T.D.A. has recently received data on the use of sawdust as a compost material and soil improver. Mr. F. C. King of Kendal states that he uses sawdust as a winter covering for undug soil to a depth of 6 in.; a dressing of 2 in. prevents 25° of frost. As a cure for woolly aphis on apple trees, an application of sawdust to the undug soil round the trees proved highly successful. The application of compost is recommended before the dressing of sawdust, in order to build up the necessary micro-organisms to reduce the sawdust. Weed control is facilitated by sawdust. [Cf. *For. Abstr.* 8 (p. 335).] (**7**; July 1947).

India. The Government of India (Hindustan) have set up a Land Management Board to deal with various problems relating to the proper utilization of land and reclamation of eroded areas with a view to increasing the production of food grains and fodder. Some of the main functions of the Board will be:—(1) to adopt measures to check further erosion and to reclaim ravines and other areas already badly eroded, with particular reference to the ravines of the Yamuna and Chambal rivers; (2) to create village fuel plantations to release cowdung for its proper use as manure and to provide small timber for agricultural implements and cottage industries; (3) to adopt measures to increase fodder supplies and grazing facilities; (4) to collect statistics dealing with all aspects of the fodder and grazing problems, including investigations into the nutrient value of leaf fodder and grasses (**14**; Sept. 1947).

Investigations carried out on Jamun [*Eugenia jambolana*] seed, hitherto treated as waste, show that it is a fairly rich source of protein and calcium, and that it can be used as a feed for livestock. Animals fed on wheatstraw and a concentrate mixture of rape cake and Jamun seed in equal proportions have been known to gain on an average about 32 lb. in 30 weeks. (**14**; 4.9.47).

Research carried out at the Forest Research Institute, Dehra Dun, has led to the taking out of a patent for the manufacture of Prolamin adhesive, which is extracted from gluten, a by-product of starch factories. This adhesive is expected to be of great importance to the Indian plywood industry, since it is very cheap to produce and approaches phenol-formaldehyde synthetic resin in efficiency (**14**; 4.9.47).

Investigations carried out at the Forest Research Station, Dehra Dun, on Tamarind seeds have resulted in the following processes, for which patents have been taken out:—(1) production of gum tamarinda as a substitute for gum tragacanth or carob seed gum; (2) production of a sizing material for cotton and jute yarns; (3) production of a creaming agent for concentration of rubber latex, from Tamarind kernel powder (**14**; 4.9.47).

Poland. In 1946 there was formed a Committee for afforestation and tree planting in the province of Wielkopolska. The objects of the Committee are to co-ordinate the activities of State institutions concerned with afforestation, to work out a general plan of afforestation for the whole province, and

to carry out the legal processes involved in the reservation of land for afforestation. One of the first activities of the committee was to examine a project for the establishment at Poznan of an agricultural and forestry hydraulic station to carry out detailed investigations, over a period of 20 years, on the influence of afforestation on climate and water regime. The project will be conducted in co-operation with the Research Institute of the Agriculture and Forestry Departments of the University of Poznan and the School of Agriculture and Forestry at Warsaw, as well as the State Forest Department. The projected station will have establishments at various points in the Province (**18**; July 1946).

Rumania. The Rumanian Forest Research Institute has organized a network of phenological stations, so that phenological observations can be made for several consecutive years on a precise and uniform plan. During 1946 (the first year of the scheme) about 200 stations were set up, all over the forested parts of the country. (**20**; Dec. 1946).

South Africa. Mexican Hawthorn (*Crataegus pubescens*) has been used effectively for producing stock-feed. The edible fruits are about the size of walnuts and are highly palatable to animals, which thrive on them. Seeds and a limited number of trees are available from the Department of Forestry (**12**; 19.3.47).

As a result of negotiations between the South African Wattle Growers' Union and the Government, it has been decided to establish a Research Institute for the Wattle industry at Natal University College, to co-ordinate research on silviculture, genetics, pathology, chemistry, and entomology. Certain details have yet to be decided upon, but the plans for the buildings are already far advanced (**3**; 1947).

South America. On August 12, 1947 a conference was opened at Belém, Brazil, which carried a stage further the proposal made to Unesco last year, that the possibility should be explored of setting up an international institute for investigating as a whole the enormous rain forest area of tropical South America. This includes the greater part of northern, central and western Brazil and parts of Bolivia, Columbia, Ecuador, Peru and Venezuela, and British, French and Dutch Guiana, and is conveniently called by Humboldt's name, the Hylean (= forested) Amazon. At the Belém conference all the countries mentioned above, with the exception of Dutch Guiana, were represented. It was agreed that the scientific investigation of the Hylean region was an activity well suited for international co-operation, and recommended that an institute for the purpose should be set up if possible (**17**; 27.9.47).

Sweden. Dr. Sven Wingquist, the inventor of ball bearings, has celebrated his 70th birthday by making over his estate of Remmingstorp in South Sweden to a forest research foundation. It is a model estate, comprising 1,500 ha., and valued at about 1 million crowns. The forests are particularly suited to scientific research (**22**; March 1947).

This summer's phenomenally dry weather has affected Sweden's rivers. Millions of logs are said to have jammed in the shallow waters, and a great deal of the timber recently cut will have to remain in the forests over the winter. It is expected that some sawmills will have to close down owing to lack of raw material (**27**; Oct. 1947).

Trinidad and Tobago. Tests are being made on the seed of *Mora excelsa* as a possible source of stock-feed. Previous analysis has shown that *Mora* seeds are intermediate between acorns and maize in fats, protein and carbohydrate. Several thousand tons of seed are available each year for collection (**1**; 1946).

In view of the rapidly increasing quantity of Teak thinnings which are available annually, it has been decided to undertake the manufacture on an experimental scale of split fencing. Teak poles do not split quite so easily as Spanish Chestnut, but it is possible to make satisfactory cleft Teak poles (**1**; 1946).

United States. An Emergency Conservation Committee has been formed in New York to fight the proposed sacrifice of a large area of the great forests of the Olympic National Park, in that part of the Park where the most remarkable trees are found, to the timber trade. The Committee

points out in a pamphlet ("The Raid on the Nation's Olympic Forests") that if Presidential proclamations and orders can be flouted in this case, there can be no guarantee of the permanence of any of the other magnificent National Parks of the United States. The consent of Congress is required for this proposed act of vandalism and the purpose of the pamphlet is to induce the people of the United States to make their voice heard in Congress against the filching from them of their own national property in the name of commercial development (**16**; Aug. 1947).

Last April the House Appropriations Committee of Congress disallowed the Bureau of Land Management estimate of $170,000 for fire control and suppression in Alaska, it being the opinion of the committee 'that such fire protection is not justified and that the saving which might result from such protection does not warrant the expenditure involved'. Less than a month and a half later the state was ablaze. During June and July one fire alone burned over 400,000 acres, and by the middle of September 123 fires were reported to have burned over 1,100,000 acres during the current year. Figures for damage in terms of value of timber and game resources destroyed and disturbance or pollution of water necessary for mining, farm crops and the highly important salmon fishery, are not yet available, but it is safe to assume that direct and indirect losses will exceed 100 times the amount that was requested for fire protection (**2**; Oct. 1947).

With a number of the 50 or more fires that have ravaged 110,000 acres of forest and townships in Maine still raging, President Truman on 25 Oct. proclaimed the whole of that state a disaster area. After a month's drought following a summer in which there was very little rain, woods in Maine are tinder dry, and now the ground is covered deep in fallen leaves, underneath which fires sometimes steal hundreds of feet unperceived before they break out into the open, often behind the lines of men working in desperate haste to dig confining fire breaks. With many streams reduced to a mere trickle, the fire fighters find the task an almost hopeless one, and when high winds ally themselves with the fires, it becomes virtually impossible to check the flames (**26**; 27.10.47).

In 31 states the U.S. Forest Service is pushing through more than 2,300 miles of access logging roads into remote mountain areas. More than 800 miles have already been completed and 1,500 miles are under construction (**25**; Feb. 1947).

American Biologists have long felt the need for a unifying organization. There are some 34 biological societies and new ones are being formed. The Union of American Biological Societies and the American Biological Society both attempted to unify biologists, the first for the specific purpose of publishing *Biological Abstracts*, and the second to perform services of the type rendered by the American Institute of Physics. The latter society never achieved its objects, and now proposes to disband in favour of a new institute. The main purpose of the proposed American Institute of Biological Sciences is to represent biological sciences in national and international matters. Its constitution and by-laws have been given provisional approval by an organizing committee and by societies that have already joined, including the American Physiological Society and the Society of American Bacteriologists. The Society of American Foresters have not yet officially considered the matter (**15**; Oct. 1947).

Tree surgeons or arborists in New Hampshire are required to pass an examination and to be registered before engaging in tree surgery, pruning, spraying, or otherwise treating fruit, shade and forest trees except in the city or town where they reside. The purpose of registration is to protect the public from unscrupulous and unqualified persons who may represent themselves as specialists. Recently a new class of aerial spraying contractors has entered the field and they also are subject to the law requiring registration (**6**; 1945–46).

The Forest Products Research Society, founded early this year by leading American and Canadian technologists, has expanded the scope of its organization to include members from Great Britian. In its first 7 months of existence the Society has reached a membership of 500 individuals (**24**; 30.9.47)

Laboratory tests made at the Oregon Forest Products Laboratory indicate that about 7½ per cent. of waste lignin from the ethyl alcohol plant at Springfield can be recovered as wax by a simple petroleum solvent extraction process. The wax has a high melting point and other characteristics that make it promising for commercial uses (**25**; Sept. 1947).

The Willamette Valley Wood Chemical Co. has terminated its lease of the Springfield plant [cf. *For. Abstr.* 8 (No. 525)] and waived its option to purchase. After producing a fair quantity of 190 proof alcohol in test runs, it was found that the works required further expenditure to get over technical

difficulties, and after investing $200,000 in the project, the lumber group decided not to proceed further. It is understood that the Government does not favour dismantling the Springfield plant, and further attempts will be made to get it into the hands of an agency that will make the necessary changes to enable it to run on the intended scale, namely 6 million gallons a year (**25**; Oct. 1947).

Zanzibar. Amendments to the Agricultural Produce (Exports) Decree have been made to render it illegal to export Mangrove bark of less than $\frac{3}{8}$ in. in thickness, which should greatly improve the average tannin content of the Zanzibar product. Efforts are to be made to zone cutting in order to ensure a constant supply of bark every year (**9**; Oct. 1947).